

NOAA's National Weather Service



NWS Service Improvement Plan - 2005

NOAA's National Weather Service
Working Together To Save Lives



www.weather.gov

Executive Summary

This second annual publication of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) Service Improvement Plan (NSIP) is a compendium of our planned product and service improvements for this year. Our plan intends to help the public and private sectors, our academic partners, our customers, and our employees to anticipate changes in NWS products and services.

NOAA's NWS is committed to continuously evaluating and improving customer service. Working with our partners and customers, we're continually assessing which experimental products and services should become operational, and which products best meet the needs of the American public. This document outlines new service efforts and changes in disseminating products.

NSIP 05 summarizes changes by the following areas:


- ✓ Customer Service
- ✓ Dissemination Services
- ✓ Aviation Weather Services
- ✓ Climate Services
- ✓ Digital Weather Services
- ✓ Fire Weather Services
- ✓ Health Weather Services
- ✓ Hydrologic Services

- ✓ Marine Weather Services
- ✓ Observation Services
- ✓ Public Weather Services
- ✓ Space Weather Services

NSIP 05, a living document, is frequently updated at the NSIP home page, <http://www.nws.noaa.gov/os/nsip.php>. NSIP 05 also will be updated after Congress passes the final budget appropriations for Fiscal Year 2005. A plan for next year, NSIP 06, will be released after the President issues the 2006 budget to Congress.

We encourage your comments, which you can submit online at the NSIP home page. Based on feedback from NSIP 04, we modified the format of the NSIP web page, and added an e-mail notification service. To register for automatic e-mail notification, go to the NSIP home page, and click "subscribe".

Contact the appropriate manager listed at the end of each service area for specific answers to individual questions.



Gregory A. Mandt
Director, Office of Climate, Water, and Weather Services

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U.S. DEPARTMENT OF COMMERCE
National Oceanic & Atmospheric Administration
NOAA's National Weather Service



Introduction

NOAA's NWS provides weather, water, and climate forecasts and warnings for the United States, its territories, adjacent waters, and ocean areas. In performing this critical mission, the NWS helps protect life and property and enhances the national economy.

NOAA customers demand increasingly reliable and specific weather, water, and climate information to make key decisions. These customers, including industry, state and local governments, and emergency managers, have multiple demands, all of which point to the need to sustain and improve NWS observing, forecasting, and warning services.

NWS data forms a national and international information infrastructure used by other Government agencies, the private sector, the university community, the public, and the global community. Some 90 percent of all presidentially declared disasters are weather related causing approximately 500 deaths and \$11 billion in damage annually. Weather is directly linked to public safety and about one-third of the U.S. economy (about \$3 trillion) is weather sensitive.

This publication, NSIP 05, compiles expected changes in NWS services for Fiscal Year (FY) 2005. NSIP is designed to quantify and explain planned changes to the public. NSIP 05 is a living document with regular updates made available at <http://www.nws.noaa.gov/os/nsip.shtml>. See the most recent updates by clicking on the "What's New" section on the NSIP page.

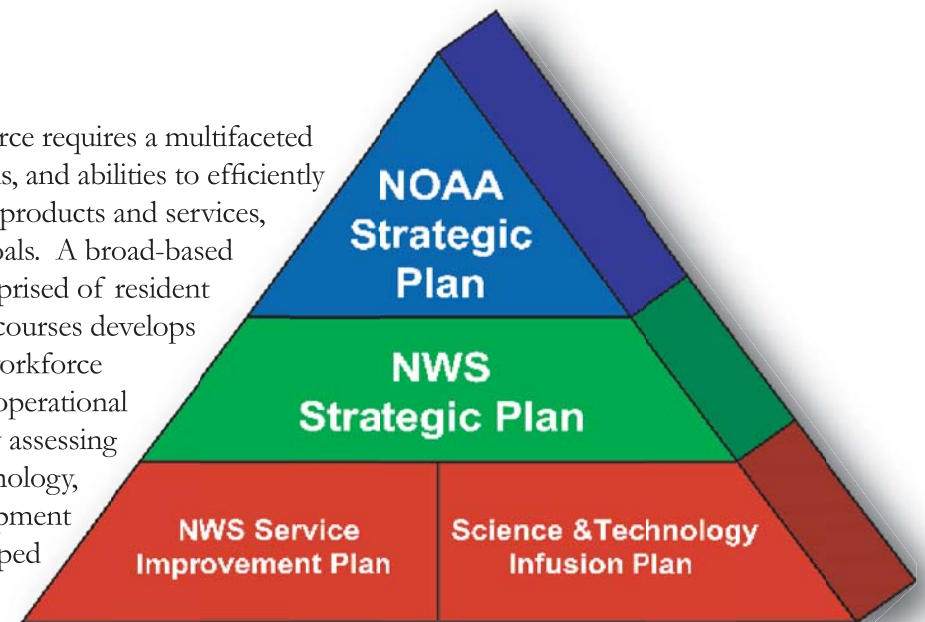
GPRA Goals

The NWS establishes and tracks key service performance improvement goals, and has been recognized as a leader in performance-based management for delivering these goals. NWS goals, supporting the 1993 Government Performance and Results Act (GPRA), are referenced and charted within the NSIP, and are submitted to the Office of Management and Budget (OMB). GPRA goals represent some of our tangible, measurable objectives. You can find more information on GPRA, at <http://www.whitehouse.gov/omb/mgmt-gpra/gplaw2m.html>.

Training

The NWS workforce requires a multifaceted set of knowledge, skills, and abilities to efficiently and effectively deliver products and services, and to meet GPRA goals. A broad-based training program comprised of resident and distance learning courses develops the expertise of our workforce and directly supports operational readiness. By annually assessing evolving science, technology, and workforce development needs, we have developed a training program needed to prepare our workforce for new

and updated services. A substantial portion of the web-based training materials used by NWS staff is available to the public on our Training Portal web site at <http://www.nwstc.noaa.gov/nwstrn>.



A trilogy of NWS documents complement the NOAA Strategic Plan.

Related Publications

Two NWS documents are referenced throughout this publication: The NWS Strategic Plan and the NWS Science and Technology Infusion Plan (STIP).

Strategic Plan

The NWS Strategic Plan identifies high-level goals, activities, and priorities for FYs 2005-2010. The NWS Strategic Plan is available at

<http://www.nws.noaa.gov/sp/>. The goals of the NWS Strategic Plan parallel the NOAA Strategic Plan. The complete NOAA Strategic Plan is available at <http://www.spo.noaa.gov/>.

- ✓ Goal I: Protect, restore, and manage the use of coastal and ocean resources through ecosystems-based management.
- ✓ Goal II: Understand climate variability and change to enhance society's ability to plan and respond.
- ✓ Goal III: Serve society's needs for weather and water information.

- ✓ Goal IV: Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation.

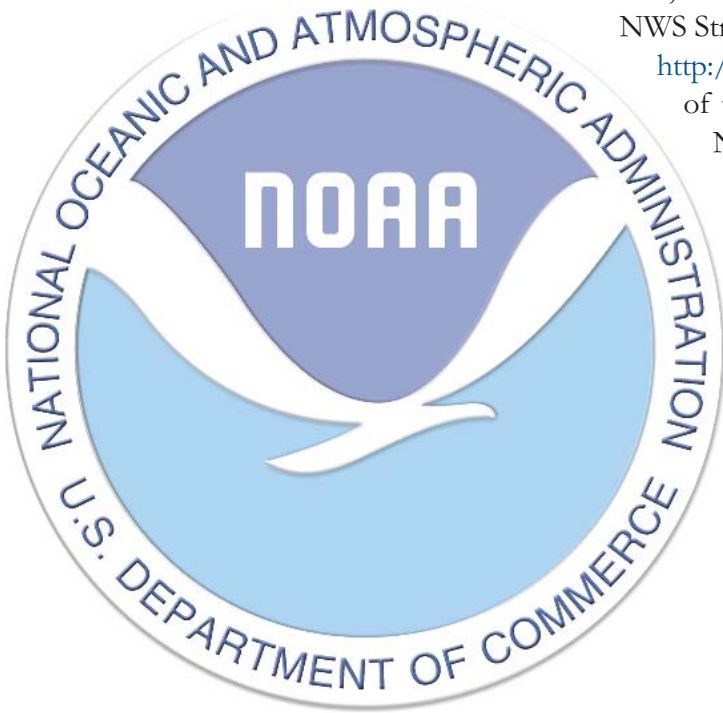
STIP

The NWS STIP, published in January, 2004, looks into the future and explains how science and technology may evolve NWS products and services. It defines long term strategies, objectives, and programs. The STIP illustrates how the NWS plans to leverage scientific opportunities beyond the next ten years. The STIP is posted at <http://www.weather.gov/ost>.

NSIP 2005

NSIP 05 translates the STIP and the NWS Strategic Plan visions into specific service improvements. This plan is based on the President's FY 2005 budget request to Congress. Contingent upon congressional funding, the NWS Office of Climate, Water, and Weather Services (OCWWS) will guide development of new products and services, as outlined in NSIP 05.

Direct overall comments on NSIP to LeRoy Spayd, Chief, Meteorological Services Division, 301/713-1858, ext. 105, or leroy.spayd@noaa.gov.



Customer Service

Vision

To satisfy customers through quality service leadership focused on customer needs.

Concept of Operations

OCWWS uses a continuous evaluation and improvement process. This process measures customer and partner satisfaction with NWS products and services; identifies needs for climate, water, and weather information; and provides for improvements and changes to meet those needs.

Customer and Partner Requirements

The NWS serves customers and partners across the nation and around the world. Our customers require accurate climate, water, and weather information and timely updates from a suite of products, with a consistent look and feel, to make informed decisions.

Developing a Customer Service Methodology

The OCWWS Customer Service Team was chartered to develop a process for evaluating NWS services through survey data, customer and partner feedback, independent assessments, and internal dialogue with NWS service providers. The team is developing a customer service methodology that includes a Customer Relationship Management (CRM) system and a continuous customer feedback process. NWS future service improvements will be, in part, driven by the responses to the surveys and the CRM system.

Managing Customer Relationships

OCWWS established a process for responding to customer inquiries and completed the pilot of the CRM system. The system is being used to measure the types of requests made and the timeliness of response. CRM allows customers and OCWWS staff to leverage an evolving knowledge base from the spectrum of NWS experts. The staff made recommendations to enhance the CRM system that will be included in a new software version in FY 2005.

Processing Customer Feedback

OCWWS implemented a process for surveying prominent customer groups to establish a customer service baseline in seven major service areas. The surveys are designed to measure customer satisfaction and to solicit feedback. The survey results are formulated into a Customer Satisfaction Index (CSI) for comparison with other Government agencies. CSI results have been generated for the Aviation, Marine, Emergency Management, and Media communities. The results of these surveys have been published by *The Washington Post*, and other major news organizations. Three additional surveys, for the hydrologic, climate, and public weather communities, will be conducted in FY 2005.

“NWS customers and partners are significantly more satisfied than customers of most other Federal Government agencies, and significantly more satisfied than customers of private sector firms.”

Sheri Teodoru
Program Director, CFI Group

Next Steps

- ✓ Complete initial surveys for hydrologic, climate, and public weather communities.
- ✓ Determine how the CSI results will be validated and integrated into a continual improvement process for NWS products and services.
- ✓ Use results of customer satisfaction surveys and other feedback to support budget requests for service improvements.
- ✓ Identify CRM system enhancements necessary to facilitate the exchange of knowledge and information with the customer community and to integrate service improvement tracking and reporting.

Milestones by Quarter

2nd Quarter

- Conduct a Hydrologic Customer Satisfaction Index survey. Release results.
- Conduct a Climate Customer Satisfaction Index survey. Release results.
- Complete enhancements for updated version of CRM system.

3rd Quarter

- Conduct a Customer Satisfaction Index survey of the general public. Release results.

4th Quarter

- Identify tools and resources to provide for continual measurement, feedback, and tracking of customer satisfaction.
- Make the CRM system accessible to all NWS.

Contact Information

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Dissemination Services

Vision

To ensure all people in the United States receive the climate, water, and weather information they want, when and where they want it. To deliver timely alerts to all people at risk of hazards.

Concept of Operations

The NWS delivers information in two major categories:

- ✓ Time-critical watches, warnings, and supporting information, directed to people in affected areas.
- ✓ Routine weather data formatted in bulletin form, bulk data form, and in digital databases. This data is archived in accessible storage, for electronic retrieval by interested parties.

The NWS relies on the delivery services provided by emergency managers; local, state, Federal, and international government agencies; the media; the commercial weather sector; academia; and community organizations.

The NWS products are in text, graphical, digital, Geographical Information System (GIS), and audio formats. The NWS also disseminates time-critical, non-weather-related emergency messages from other Government authorities. These additional “all hazards” emergency messages may include both natural and technological events.

More information on dissemination services is available at <http://www.nws.noaa.gov/os/disemsys.shtml>.

Customer and Partner Requirements

The requirements of our partners and customers are evolving. The NWS is working to ensure response to the following requirements:

- ✓ Timeliness: Deliver data in a timely manner.
- ✓ Interactivity: When a user requests to pull information from NWS file servers, that information will be delivered in a reasonable time period to the extent it is within NWS control.
- ✓ Reliability: The service must be completely reliable for warnings and watches.
- ✓ Quality: Product formats and codes will be consistent. Dissemination systems should not degrade the quality of the original information.
- ✓ Adaptability: Formats and mechanisms will adapt to changing needs. The architecture will be built on industry standards, which can interface with new technologies, such as mobile devices.
- ✓ Capacity: NWS and its dissemination partners need to plan capacity expansion for a growing number of users and for increased volumes and complexities of data.

Science and Technology Requirements

- ✓ Deliver critical information using industry standards, including eXtensible Markup Language (XML) and Common Alerting Protocol (CAP).
- ✓ Deliver information in new formats to support gridded, graphical, GIS, and textual distribution and display.
- ✓ Develop an interactive forecast system from which customers produce user-defined, site-specific forecast information.
- ✓ Develop geo-targeted watches and warnings addressed to sub-county areas.

Integrated Requirements

- ✓ Deliver baseline product formatters to NWS offices.
- ✓ Install quality control checker software in baseline watch/warning/advisory product generation applications.
- ✓ Disseminate event-driven watch/warning/advisory products with Valid Time Event Code (VTEC).

Service Area Highlights

Aviation

- ✓ Deliver new and improved products via the NWS Family of Services.
- ✓ Distribute significant weather forecast products internationally with the International Satellite Communications System (ISCS).
- ✓ Develop and implement a comprehensive residence and distance-learning training program for meteorologists and pilots in the use and availability of forecast products.
- ✓ Release additional information at <http://aviationweather.gov/>.

Climate

- ✓ Post all climate products, experimental and official, on the Internet at <http://www.cpc.ncep.noaa.gov/> and <http://www.nws.noaa.gov/os/csd/>.

Digital

- ✓ Share the digital forecast database and conversion tools, with a large host of clients.
- ✓ Visit these Internet sites for more information: <ftp://tgftp.nws.noaa.gov/SL.us008001/ST.expr/DF.gr2/DC.ndfd/>, <http://www.nws.noaa.gov/forecasts/graphical/>. Tools are also available at http://www.nws.noaa.gov/mdl/NDFD_GRIB2Decoder/.

Fire

- ✓ Include Remote Automatic Weather Stations (RAWS) on Emergency Managers Weather Information Network (EMWIN).
- ✓ Release additional information at <http://raws.boi.noaa.gov/rawssum.html> and <http://fire.boi.noaa.gov/>.

Hydrologic

- ✓ Continue enhancing the Advanced Hydrologic Prediction Service (AHPS) Web pages.
- ✓ Update information at <http://www.nws.noaa.gov/oh/ahps/> and <http://www.nws.noaa.gov/os/water/>.

Marine

- ✓ Expand prototyping cell-phone compatible marine and tropical cyclone products.
- ✓ Prototype a remote radiofax monitoring system.
- ✓ Update information at <http://www.nws.noaa.gov/om/marine/home.htm#dissemination> and <http://www.nws.noaa.gov/om/marine.shtml>.

Observing

- ✓ Develop and implement access to high-resolution surface mesonets through the Meteorological Assimilation Data Ingest System (MADIS).
- ✓ Update information at <http://www-sdd.fsl.noaa.gov/MADIS/> and <http://www.nws.noaa.gov/os/coop/recent-obs.htm>.

Public

- ✓ Streamline the public weather product suite by tailoring information and services to reduce redundancy and increase consistency.

Space

- ✓ Update information on space weather services at <http://www.sec.noaa.gov/SWN/>.

Service Change

- ✓ Deploy digital capability to streamline creation, authentication, and collection of non-weather emergency messages in a quick and secure fashion. This will speed alert and warning dissemination to support NOAA's responsibility in the National Response Plan (NRP), including using NWS dissemination systems to publicize alerts and warnings.

Milestones by Quarter

1st Quarter

- Test and evaluate VTEC.

2nd Quarter

- Implement VTEC in most event-driven text products to provide supplementary information to the Universal Geographic Code (UGC), and further aid in automated delivery of NWS text products.



NWS Dissemination services deliver communications during the most deadly natural hazards, including tornadoes.



NWS Meteorologist Wayne Weeks explains benefits of NOAA Weather Radio All Hazards to an avid sea kayaker during the Smithsonian Folklife Festival in Washington, D.C.

3rd Quarter

- Issue new experimental tropical cyclone product with VTEC for partner and customer evaluation.

4th Quarter

- Implement improved audio and Internet-accessible listings of NOAA Weather Radio All Hazards (NWRAH) station broadcast service areas and the associated six-digit Specific Area Message Encoding (SAME) code needed to program weather radio receivers.

Outreach

- ✓ Conduct VTEC and warning dissemination capabilities briefings at appropriate media and hydrometeorology industry conferences, including those of the National Weather Association (NWA), American Meteorological Society (AMS), National Association of Broadcasters (NAB), and the Radio and Television News Directors Association (RTNDA).
- ✓ Continue interactions with partners and customers in all phases of the VTEC Operational Tests and Evaluations (OT&E).
- ✓ Continue interactions with the Department of Homeland Security (DHS), Federal Communications Commission (FCC), Media Security and Reliability Council, Partnership for Public Warning (PPW), and other Federal, state, and local agencies involved in homeland security.
- ✓ Present all-hazards dissemination and NWRAH exhibits at government and industry conferences including NAB, National League of Cities (NLC), Consumer Electronics Show (CES), Association of Late Deafened Adults (ALDA), Self Help for Hard of Hearing People (SHHH), PPW, International Association of Emergency Managers (IAEM), and National Emergency Management Association (NEMA).
- ✓ Conduct NWS Family of Services and NWS Partners workshops.

Contact Information

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Service Areas

Aviation Weather Services

Vision

To develop, deploy, and operate an efficient and accurate aviation weather services program, and to deliver timely and accurate weather information required for safe and efficient operation of the National Airspace System (NAS).

Concept of Operations

Weather and its related impacts are the single greatest cause of disruption to the American aviation system. Weather disruptions account for approximately 70 percent of delays in the NAS and nearly 200 general aviation fatalities annually. The aviation weather services program focuses on the following areas to develop and deliver products that reduce weather-related delays and increase safety:

- ✓ Coordinate global, international, and regional aviation standards, recommended practices, and operational issues to protect U.S. policy and interests.
- ✓ Integrate NWS resources at the national, regional, and local levels.
- ✓ Leverage interagency research and development efforts to improve observational capabilities and forecast products.

- ✓ Increase the quality and quantity of weather observation sets.
- ✓ Improve accuracy and operational relevance of aviation weather forecasts.
- ✓ Deliver aviation weather products in formats that are easy to use and easily verifiable.
- ✓ Train users in the availability and use of forecast products.

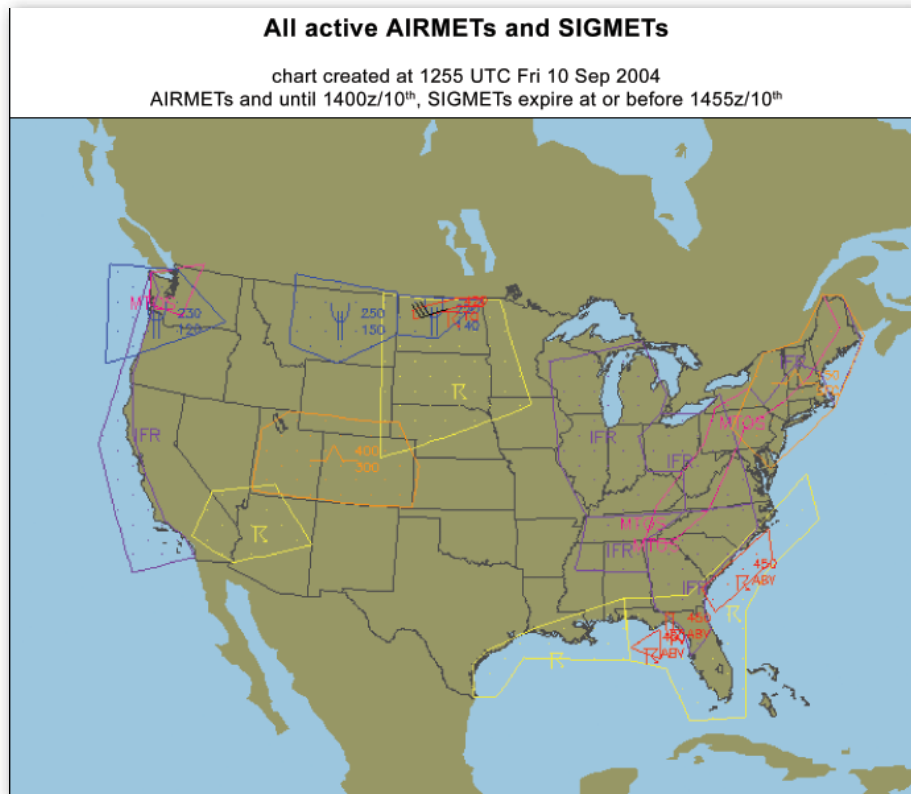
Customer and Partner Requirements

Requirements for the following capabilities have been developed in close cooperation with the Federal Aviation Administration (FAA) and the aviation industry:

- ✓ Obtain aviation-relevant observation data to deliver products meeting FAA accuracy requirements.
- ✓ Improve observations from aircraft.
- ✓ Deliver all aviation weather products in user-friendly formats.



- ✓ Train all aviation meteorologists, air traffic controllers, briefers, dispatchers, and pilots on the use of aviation weather products.
- ✓ Verify all aviation products in near real-time for forecaster feedback and increased user confidence.



Graphic representation of all active AIRMETs and SIGMETs found on the Aviation Digital Database Web site at: http://adds.aviationweather.noaa.gov/data/airmets/airmets_ALL.gif. AIRMETs and SIGMETs will be enhanced by the expanded collection of PIREPS.

Link to Science and Technology Infusion Plan

The aviation program leverages science and technology initiatives to increase the accuracy, specificity, and lead time of aviation forecasts and warnings, for more effective planning and decision making. Specific science and technology areas of focus include:

- ✓ Increase the resolution of wind and temperature observations.
- ✓ Improve the data quality and timeliness of wind and moisture observations.
- ✓ Expand aircraft observations.
- ✓ Improve model physics (Regional Common Atmospheric Modeling System) with rapid refresh rates.
- ✓ Incorporate the vertical dimension of aviation forecast parameters in the Interactive Forecast Preparation System.
- ✓ Develop probabilistic forecasts targeted to the FAA and U.S. airline decision support systems.

Product and Service Changes

- ✓ Deliver satellite-developed volcanic ash detection product to NOAA's Volcanic Ash Advisory Center, Weather Forecast Offices (WFOs), the Alaska Aviation Weather Unit (AAWU), and Aviation Weather Center (AWC).

- ✓ Deliver satellite-developed low cloud detection products to WFOs, the AAWU, and the AWC.
- ✓ Transition the Real Time Verification System (RTVS) capability from NOAA's Forecast Systems Laboratory (FSL) to operational use within NWS.
- ✓ Transition the Super Cooled Large Droplet (SCLD) product derived from the Forecast Icing Potential (FIP) product from the Aviation Weather Research Program (AWRP) to operational use within the NWS.
- ✓ Deliver hardware required to host expanded aviation databases to the AAWU and the AWC.
- ✓ Update the Aviation Forecast Preparation System (AvnFPS).
- ✓ Offer Distance Learning Aviation Course 2 (DLAC2) training on convective forecasting.
- ✓ Offer Aviation Operations Course (AOC) for NWS forecasters.
- ✓ Deliver updated general aviation pilot "interpretation of weather products" training seminar in cooperation with the Aircraft Owners and Pilots Association (AOPA).

Science and Technology Requirements

- ✓ Increase understanding of fundamental physics.
- ✓ Improve algorithms.
- ✓ Improve high-speed processing.
- ✓ Incorporate the vertical dimension of aviation forecast parameters into the Interactive Forecast Preparation System (IFPS).

GPRA Performance Measures

The aviation weather services program GPRA performance measure is the percentage of time that Instrument Flight Rules (IFR) conditions are correctly forecast. The Probability of Detection (POD) and the percentage of time that IFR conditions are predicted but do not occur, called the False Alarm Rate (FAR), comprise the GPRA metric.

GPRA Performance Measures

| GPRA Goal* | FY 2003 | FY 2004 | FY 2005 |
|---------------------------------|---------|---------|---------|
| Probability of Detection | 45% | 46% | 46% |
| False Alarm Ratio | 71% | 70% | 68% |

* IFR Conditions are defined as Ceilings \geq 500 ft & $<$ 1000 ft, Visibility \geq 1 mile & $<$ 3 mile

Weather-related operational disruptions in the NAS, and weather-related flight mishaps are associated with conditions requiring aircraft to operate under IFR. Therefore, providing pilots, dispatchers, and flight controllers with accurate and reliable forecasts of IFR conditions, particularly in the 2-to-6 hour forecast

time frame, will substantially reduce both disruptions in scheduled flight operations and the number of flight mishaps caused by inadvertent entry into flight conditions that exceed pilot capabilities.

Other Performance Measures

In addition to tracking performance against the GPRA IFR forecast accuracy metric, the Aviation Services branch tracks 11 performance measures that quantify our progress in satisfying customer and partner requirements:

- ✓ Increase the number of aircraft reported in-situ observations.
- ✓ Increase the number of satellite products produced.
- ✓ Improve the accuracy of convective forecasts.
- ✓ Improve the accuracy of ceiling and visibility forecasts.
- ✓ Decrease weather-related accidents per 100,000 flight hours.
- ✓ Reduce the percent of air traffic delays attributed to weather.
- ✓ Increase the number of U.S. airports serviced with Terminal Aerodrome Forecasts (TAF).
- ✓ Increase the number of new or improved forecast products.

- ✓ Increase the percentage of NOAA operational weather products integrable with navigation and traffic management systems.
- ✓ Increase the percentage of personnel trained on aviation weather products.
- ✓ Release at least one new or improved aviation training course per year.

Milestones by Quarter

1st Quarter

- Deliver satellite-developed low cloud products.
- Update AvnFPS.
- Deliver training material for AOPA/Air Safety Foundation (ASF) general aviation pilot “Interpretation of Weather Products” training seminar.

2nd Quarter

- Deliver satellite-developed volcanic ash detection product.

3rd Quarter

- Deploy hardware for new and expanded aviation databases.
- Deliver the SCLD product derived from the FIP, to the AWC.
- Update AvnFPS.

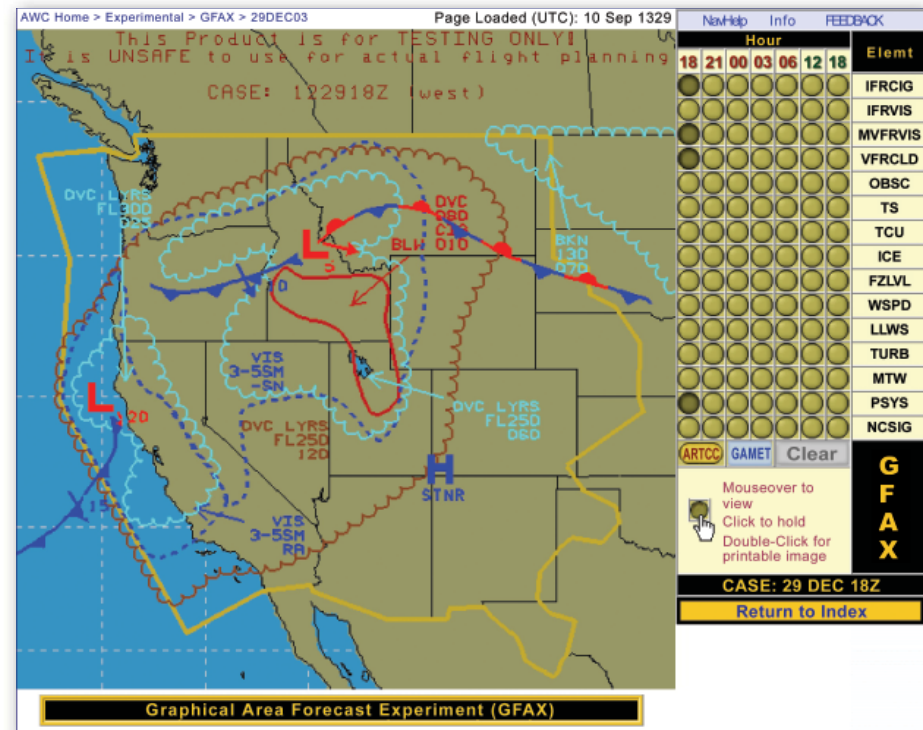
4th Quarter

- Test DLAC 2 for convective forecasting.
- Deploy RTVS to the NWS.
- Install at least 25 water vapor sensors on aircraft for in-situ observations.

- ✓ Continue work with AOPA, ASF and Meteorlogix, Inc., to develop online general aviation pilot weather training.
- ✓ Continue development of Meteorologist “In the Loop” capability for FAA/AWRP automated products.

Integrated Requirements

- ✓ Help set international requirements for aviation meteorology and development of forecasting tools by participating in International Civil Aviation Organization (ICAO) meetings.
- ✓ Develop and deploy a system to capture moisture and turbulence measurements from available air carriers.
- ✓ Expand collection and use of General Aviation PIREPS from 2,000 to about 5,000 daily to fill a void in reporting en-route conditions.
- ✓ Continue transition of applied research efforts focused on improved observing capabilities, detection, and forecast accuracy.
- ✓ Continue development of DLAC courses and aviation exercises for incorporation into the NWS forecaster weather event simulator.



Example of the experimental Graphical Area Forecast over the Western region

- ✓ Continue developing of initial Guidance TAF. The Guidance TAF capability, generated by higher resolution model output, will significantly improve forecaster efficiency. This capability will allow for the production of significantly more TAFs without increasing staff, and allow local forecasters to focus on short-term\terminal forecasting and severe weather warnings.
- ✓ Continue developing the integrated forecast process to strengthen Center Weather Service Unit (CWSU)/Air Route Traffic Control Center (ARTCC) operations.
- ✓ Conduct operational test and evaluation of terminal (hub) forecast and Tactical Decision Aid (TDA) at selected CWSUs.
- ✓ Continue work with the NOAA, DOC, FAA and the Office of the Federal Coordinator for Meteorology (OFCM) at the Joint Planning and Development Office to publish a national strategic plan for aviation weather.
- ✓ Work with the FAA and aviation users to continue developing of the graphical aviation forecast to provide aviation weather information in a digital format in 2006.
- ✓ Work closely with aviation industry representatives such as AOPA, the NBAA, the Air Transport Association (ATA), the International Air Transport Association (IATA), the Small Aircraft Manufacturers Association (SAMA), the Helicopter Association International (HAI), and the Experimental Aircraft Association (EAA) to foster better relationships, to promote NWS aviation products and services, and to ascertain additional customer requirements.
- ✓ Exhibit at trade shows such as AOPA National and local Fly-Ins, NBAA National Meeting, HAI International Meeting, and 2005 EAA Sun 'n Fun Fly-In and Air Venture.

Verification

The ability to conduct automated real-time verification of new or improved observational capabilities and forecast products is developed in parallel with each capability and product. When capabilities and products are delivered, the ability to conduct real-time verification is delivered with them.

Regional Initiatives

Alaska

- ✓ Integrate newly developed Volcanic Ash Coordination Tool (VACT) into Anchorage Volcanic Ash Advisory Center (VAAC) daily operations.

Outreach

- ✓ Work closely with the FAA and National Aeronautics and Space Administration (NASA) to foster better working relationships and facilitate requirements setting.

- ✓ Develop an implementation plan to transition AAWU operations over to Graphical Area Forecast (GFA).
- ✓ Use new “Stats on Demand” verification system to develop a standardized, region-wide TAF verification program that focuses on detecting and correcting potential TAF deficiencies.

Eastern

- ✓ Develop five new TAF sites.
- ✓ Generate site-specific Instrument Flight Rules (IFR) goals to supplement regional and national performance measures.
- ✓ Provide software for Weather Event Simulators to the CWSUs.
- ✓ Develop a Weather Event Simulator case for CWSU operations, incorporating the Collaborative Convective Forecast Product, the AWIPS Remote Display, and FAA’s Weather and Radar Processor.

Southern

- ✓ Collaborate with FSL to improve short-term timing and location forecasts of convection near hub airports via the Meteorologist in the Loop initiative at WFO Dallas-Ft. Worth.

Western

- ✓ Issue a Regional Supplement enhancing the training program for forecasters preparing aviation products.
- ✓ Develop a baseline for the lead time of short-fused and long-fused Airport Weather Warnings.

Contact Information

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Climate Services

Vision

Comprehensive NWS climate services that are easily accessible, well understood, optimally used, and satisfy all customer needs.

Concept of Operations

Climate services include real time monitoring, forecasting products, models and technology, observations, and customer outreach and education. OCWWS Climate Services sets policy and requirements, secures and allocates resources, and acts as the national coordinator for NWS regional and local climate services.

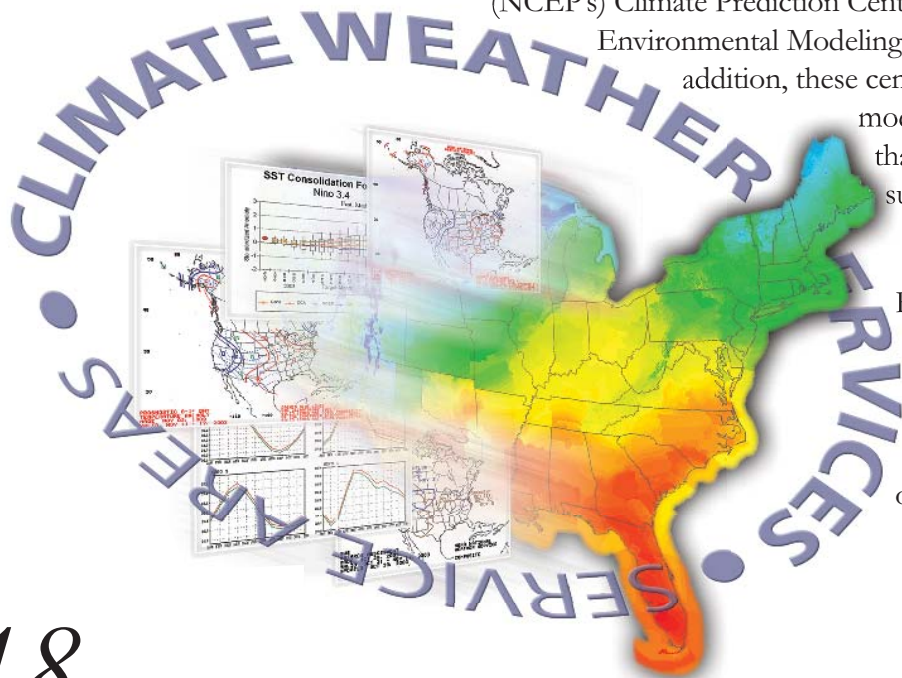
The main production centers for monitoring, forecasting, and forecast guidance products are the National Centers for Environmental Prediction's (NCEP's) Climate Prediction Center (CPC) and the Environmental Modeling Center (EMC). In addition, these centers develop the models and technology that support the product suites.

NWS Regional and Field Offices are the front lines for observing system stewardship, local products, and customer outreach and education.

For more information on climate services, please visit <http://www.nws.noaa.gov/om/csd>.

Customer and Partner Requirements

- ✓ Provide additional regional and local detail to national forecasts.
- ✓ Ensure the issuance time of CPC products favors U.S. equity and commodity market interests.
- ✓ Provide climate forecasts based on ensemble prediction techniques.
- ✓ Provide verification for all forecast products.
- ✓ Make tools and data used in forecast development publicly available.
- ✓ Partner with local expertise for development and delivery of products and for customer and stakeholder interaction.
- ✓ Tailor forecasts and guidance to varying sophistication of constituent audiences.
- ✓ Ensure data continuity principles are followed in managing surface and upper air data.
- ✓ Strengthen climate services partnerships to leverage existing infrastructure for data quality control, Cooperative Observer Program (COOP) legacy and modernization, and the development and delivery of products.



Link to Science and Technology Infusion Plan

Climate Services has long range plans for the following:

- ✓ Achieve temporal understanding of North American Monsoon System.
- ✓ Improve atmosphere, ocean, and land data assimilation systems to provide more accurate initial conditions of these earth system components for climate prediction models.
- ✓ Improve week-2 forecasts through successful inclusion in dynamic and statistical models of influences of the Madden-Julian Oscillation (MJO) and weather regime breaks.

Product or Service Change

- ✓ Develop a media toolkit web-site where WFO personnel, the media, and general audiences can find information on NWS climate services in a user friendly, accessible format.
- ✓ Develop coordinated data quality control strategy with climate services partners.
- ✓ Develop a web site to alert users of Local Climatological Data (LCD) sites of impending changes that could introduce discontinuities in the data record.
- ✓ Develop a national standard and format for climate observation products.

- ✓ Support national implementation of Applied Climate Information System (ACIS) XMClimate functionality for field offices with some subset of capability available free to the public.
- ✓ Disseminate a nationally standardized product that contains all in-situ daily published climate data summaries available in near real time from the Automated Surface Observing System (ASOS) and COOP programs.

GPRA Performance Measures

| GPRA Goal | FY 2003 | FY 2004 | FY 2005 |
|-------------------------------------|---------|---------|---------|
| Improve US Seasonal Forecast Skill* | 20 | 21 | 22 |

* The Heidke Skill Score has a value of 100 when all forecasts are correct and has a value of zero when the number correct is equal to the expected number correct by a random forecast.

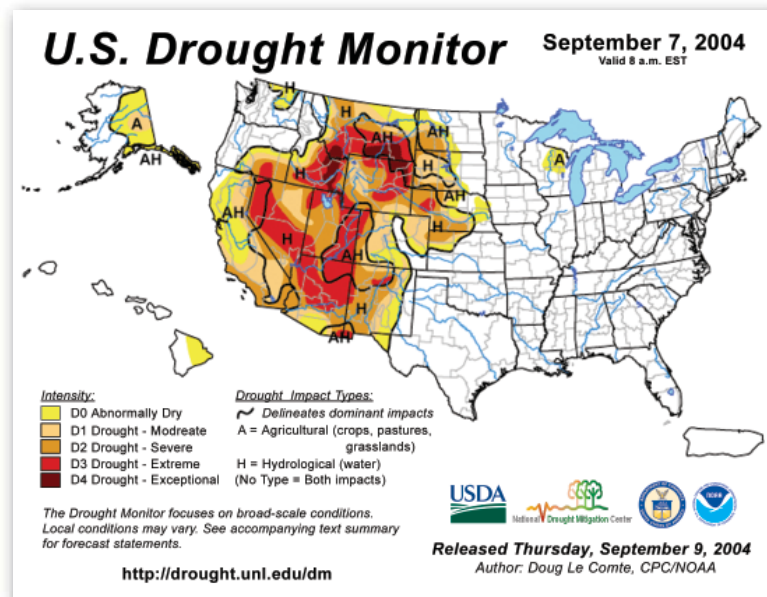
Science and Technology Requirements

- ✓ Implement ASOS V2.8 software to remove false precipitation reports from ASOS airport data collection sites.
- ✓ Investigate feasibility of automated snowfall reporting.
- ✓ Develop and demonstrate the land component of the national and global data assimilation system to provide the land state conditions for climate prediction models and drought monitors and outlooks.

Milestones by Quarter

1st Quarter

- Upgrade ocean monitoring from Tropical Pacific Ocean Data Assimilation System (ODAS) to operational Global ODAS.
- Implement calibrated wind chill forecasts.
- Host all of the Climate Forecast System (CFS) hindcast monthly mean data on the EMC NOMAD server, and send daily data from real time runs, along with relevant hindcast and analysis climatology files, to the NOAA Telecommunications Operations Center (TOC) where they will reside for 7 days.



2nd Quarter

- Produce informational brochures, for the general public, on several climate topics.
- Make ACIS/XMClimate functionality available to all field offices.
- Complete implementation of standard WFO, regional, and national climate internet pages.
- Make available additional CFS fields for user access available on the

Internet. These fields include basic variables on 17 standard pressure levels, more than 30 other fields, as well as five variables at all 40 levels of the ocean model.

3rd Quarter

- Develop a consolidated objective seasonal prediction tool.
- Complete a pre-implementation evaluation of the Regional Climate Data Assimilation System (RCDAS).
- Expand skill documentation of important CFS fields, such as sea-level height and wind shear for hurricane forecasting.

4th Quarter

- Activate web site to alert data users to planned data discontinuities at published NOAA LCD sites.
- Begin implementing new coordinated data quality control procedures.
- Work with the World Meteorological Organization (WMO) to plan an international workshop to address a continuous scale for El Niño and La Niña and gain widespread recognition that definitions adopted by NOAA are appropriate for monitoring and predicting of El Niño Southern Oscillation (ENSO) impacts in North America.
- Release new experimental Local Climate Product of station seasonal temperature,

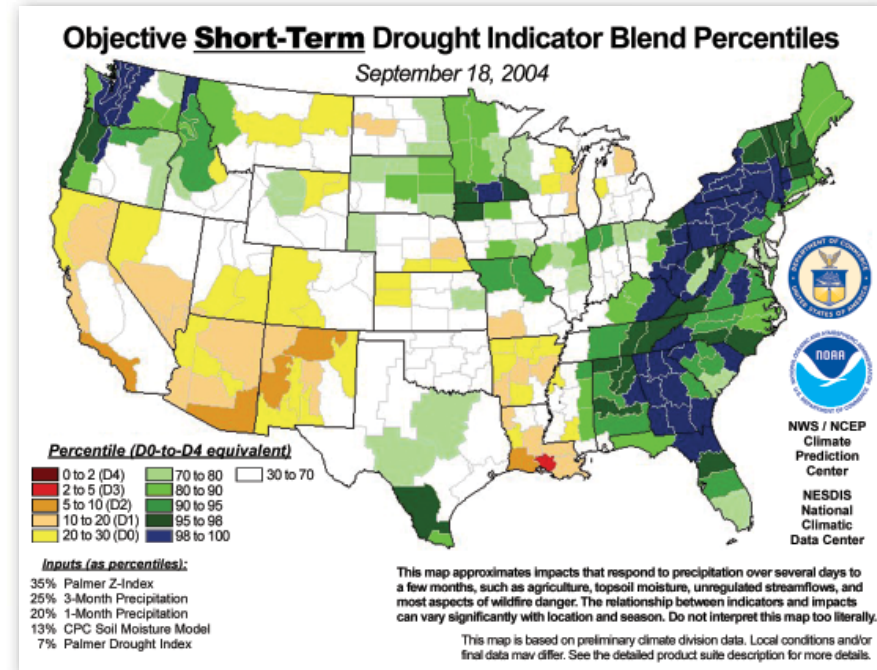
NOAA's Climate Prediction Center (CPC) and National Climatic Data Center (NCDC), the U.S. Department of Agriculture, and the National Drought Mitigation Center (NDMC) jointly issue this weekly product at <http://www.cpc.ncep.noaa.gov>.

based on statistical downscaling from CPC forecast division Probability of Exceedance Outlook.

- Implement Probability of Exceedance for days 6-10 and days 8-14 forecasts.
- Evaluate impact of Climate Diagnostics Center's (CDC's) calibrated forecasts.
- Prepare a review of last 10 years of seasonal forecast performance.
- Compare MJO characteristics between global GFS and CFS.
- Provide verification products for the CFS, as needed, to conform to the WMO Standardized Verification System for long range forecasts in partnership with other WMO global producers.
- Implement a common template for climate data throughout NWS web sites.
- Convert ocean data streams for marine and climate forecasting to a system based on the binary universal format for the representation of meteorological data (BUFR) and interact with community users.

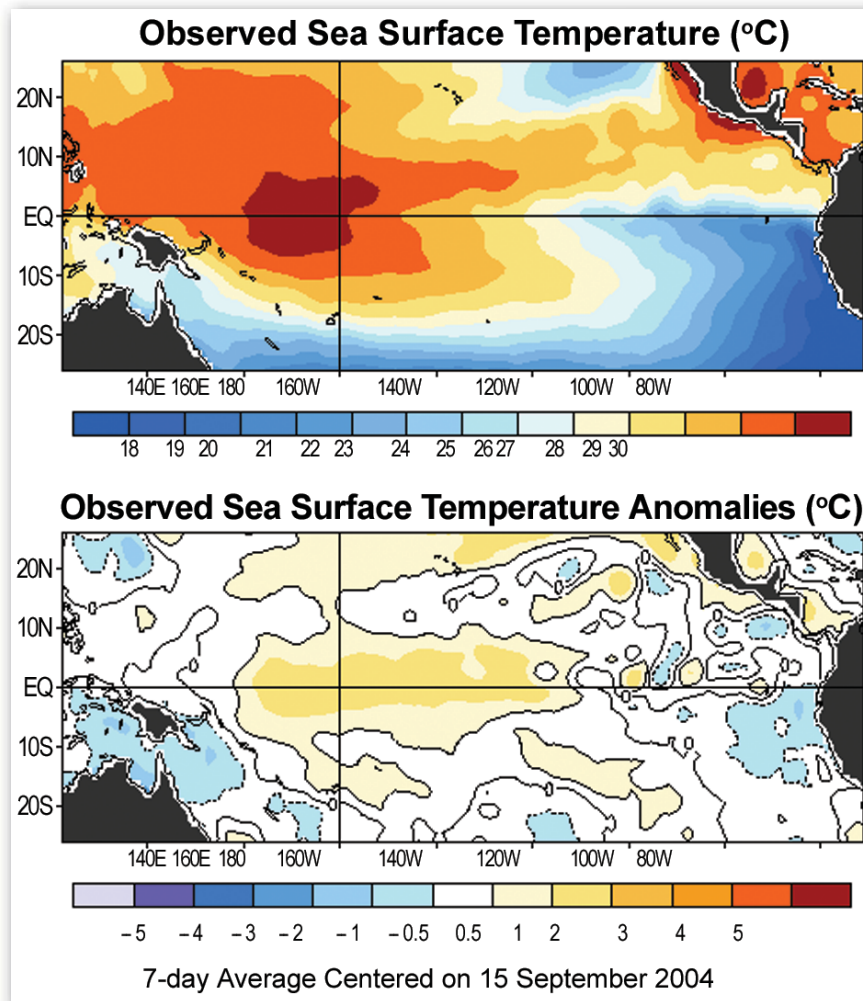
Outreach

- ✓ Conduct Climate Prediction Applications Science workshop for researchers and developers of applications of climate forecasts.



The experimental Short-Term Drought Indicator Blend is designed to supplement the Drought Monitor.

- ✓ Collaborate with the Regional Climate Centers (RCCs), the State Climatologists, the Regional Integrated Science and Assessments (RISAs), the CDC, the National Drought Mitigation Center (NDMC), and the International Research Institute for Climate Prediction (IRI) on customer services and requirements.
- ✓ Work with NWS regions to develop a uniform climate services Web presence.
- ✓ Post products available to the public at <http://www.cpc.ncep.noaa.gov/products/forecasts>.



The Observed Sea Surface Temperature, a record of observations, is available at http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/. In 2005, the ocean data assimilation system will expand from Tropical Pacific to global.

Verification

- ✓ Design a verification program for the complete CPC suite of forecast products.
- ✓ Implement the WMO Standard Verification System for Long Range Forecasts to support CFS guidance products.

Regional Initiatives

- ✓ Continue developing regional climate service programs by incremental increases in local office Internet services and products.
- ✓ Improve collaborative efforts by holding sub-regional meetings with state climatologists, RCCs and appropriate WFOs, RFCs, and other partners.

Southern

- ✓ At the WFO level, begin routine dissemination of a Daily Climate Report (CLI) product for at least 10 new locations within the Southern Region to provide decision makers with local climate information.

Contact Information

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Digital Weather Services

Vision

To meet customer and partner needs for high-quality, accessible, and reliable digital climate, weather and weather services.

Concept of Operations

NWS Digital Services provide environmental information in digital form, from where technology can be leveraged. By employing digital technology, the NWS is revolutionizing the way weather information is produced, accessed, and analyzed.

The National Digital Forecast Database (NDFD) is the primary portal for accessing this seamless national mosaic of NWS forecast information.

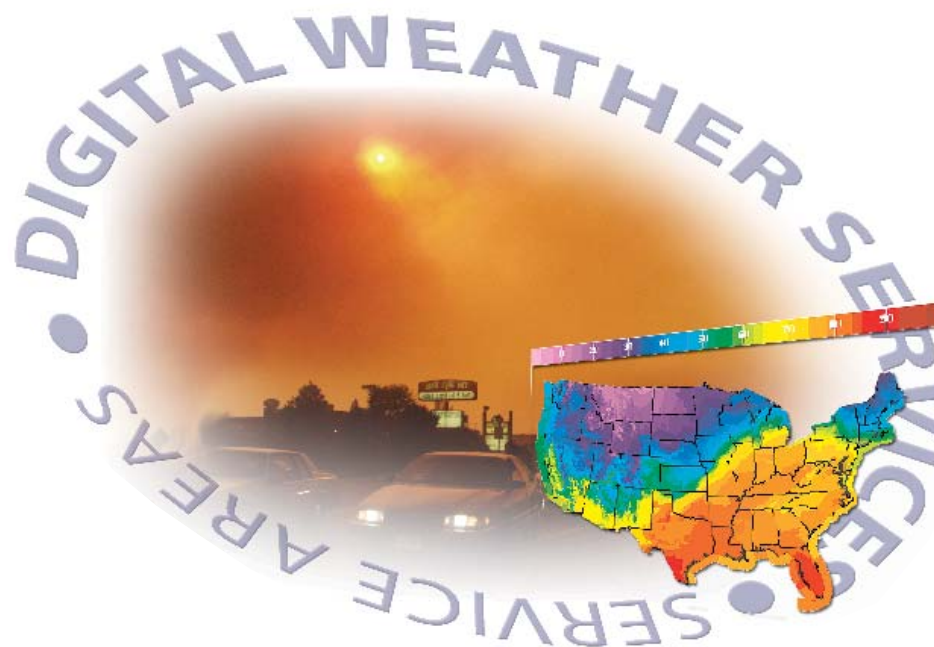
Forecasters at local NWS offices use NCEP guidance, and the latest technology to issue their forecasts as a high-resolution database. From this digital data set, products are generated in multiple formats, locally and centrally, by the NWS, its partners, and customers.

The FY 05 plan for digital services focuses on making NDFD grid elements official products, and gathering and integrating requirements and feedback from our customers.

For more information visit <http://www.nws.noaa.gov/ndfd>.

Customer and Partner Requirements

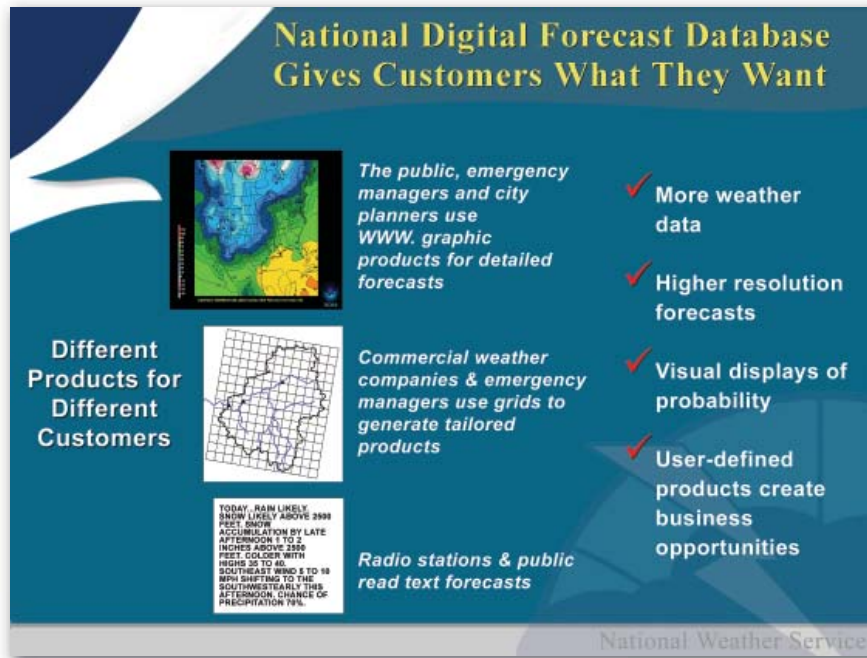
- ✓ Provide timely and consistent weather information.
- ✓ Deliver information in a variety of formats.
- ✓ Generate higher temporal and spatial resolution of weather information.
- ✓ Provide support for weather enterprise.
- ✓ Allow easier access to dissemination systems.
- ✓ Establish a digital services list server to facilitate communication.
- ✓ Follow effective change management procedures for implementing experimental and official products.



Link to Science and Technology Infusion Plan

Visionary science and technology will support digital database modifications through the integration of observing systems, improved forecast preparation applications, and expanded data coverage. Future database content and functionality will include:

- ✓ Probabilistic information
- ✓ Observations
- ✓ Hazardous weather information
- ✓ Analyses of records



Overview of NDFD capabilities

- ✓ Historical data
- ✓ Increased resolution (horizontal, vertical, and temporal)

Product and Service Changes

Most traditional, text-based NWS forecast products will be generated from the weather element grids produced by local NWS offices. The initial set of experimental grids includes the following forecast and derived elements:

- ✓ Maximum temperature
- ✓ Minimum temperature
- ✓ 12-hour probability of precipitation
- ✓ Sky cover
- ✓ Weather
- ✓ Surface temperature
- ✓ Wind direction and speed
- ✓ Quantitative precipitation forecast
- ✓ Dewpoint
- ✓ Significant wave height
- ✓ Snow accumulation

Science and Technology Requirements

- ✓ Employ Interactive Forecast Preparation System (IFPS) grid editing tools primarily developed at the local offices and used in the creation of NDFD forecast grids.
- ✓ Use collaboration tools at the forecast offices and NCEP to exchange information about the meteorological situation.
- ✓ Develop “smart” tools (algorithms that derive or modify weather elements) for quality assurance.
- ✓ Employ Internet XML-based Web services, designed to provide computer application and integration into NWS data sets using commonly accepted internet data interchange formats.

Milestones by Quarter

Customer and partner feedback on experimental grids will be continually evaluated during FY 05.

1st Quarter

- Release initial set of official NDFD weather elements.
- Implement a nationally standardized local interface for NDFD graphics.
- Print and distribute *NWS Digital Services Operations Concept* to partners in government, industry and academia.

- Transition from Operational Readiness Demonstration (ORD) to Initial Operating Capability (IOC) for the NWS Pacific Region.
- Conduct regional digital services forums.

2nd Quarter

- Conduct regional digital services forums.
- Release experimental Relative Humidity (RH), and Apparent Temperature grids.

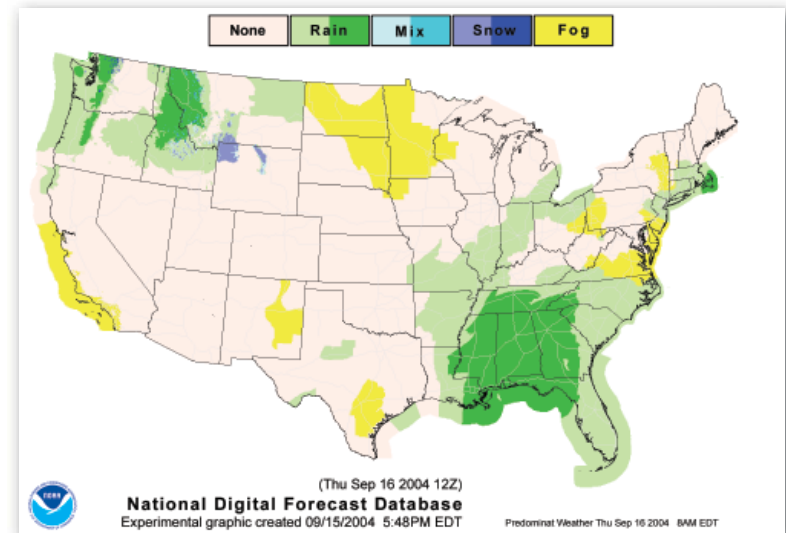
3rd Quarter

- Release additional NDFD grid elements as official NWS products.
- Conduct regional digital services forums.

4th Quarter

- Release experimental Wind Gust, Max Quantitative Precipitation Forecast (QPF), Marine Visibility, and Swell Height and Direction grids.
- Transition from ORD to IOC for the NWS Alaska Region.

Additional new product information is available at http://www.nws.noaa.gov/os/notification/tin04-18ndfd_update.txt.



NDFD Weather Forecast Map showing national weather conditions during the landfall of Hurricane Ivan.

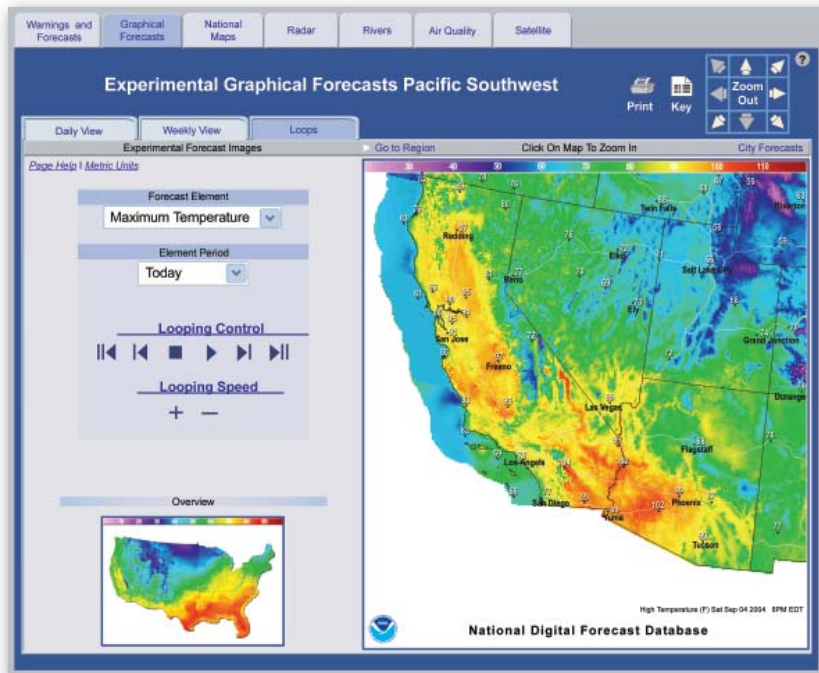
Integrated Requirements

The long-range digital services goal is a stable technology path that integrates observations, forecasts, and warnings into an environmental digital database of climate, weather, and water information.

Outreach

New information on the digital service program will be shared at the following venues:

- ✓ NWA and AMS meetings and conferences.
- ✓ IAEM and NEMA annual conferences.



NDFD Pacific Southwest Maximum Temperature Forecast Map.

Verification

While a gridded verification system is being developed, the initial NDFD verification will consist of a nearest grid point-based scheme and verification of selected NDFD-based/generated alphanumeric products. This includes an automated daily forecast critique process, which will continue to be used in field offices.

NWS will expand the point-based verification beyond Model Output Statistics (MOS) guidance points to include surface observation points.

Regional Initiatives

Alaska

- ✓ Begin second ORD for IFPS.

- ✓ Transition from ORD to IOC.

Pacific

- ✓ Transition from ORD to IOC.

Southern

- ✓ Convert data to NetCDF format on regional server, then to Gridded Binary 2 (GRIB2) on NDFD central server.

Contact Information

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Fire Weather Services

Vision

To eliminate weather-related wildland fire fatalities and injuries, and to reduce fire suppression and land management costs by providing more timely and accurate weather information.

Concept of Operations

When fuels and meteorological conditions warrant, WFO forecasters issue Fire Weather Watches and Red Flag Warnings for fire weather patterns that contribute to extreme fire danger. Site-specific forecasts may also be generated to support land agency's efforts to suppress or control wildland fires.

Fire Weather Services provide on-site meteorological support to wildland fires. This support is done by sending specially trained Incident Meteorologists (IMET) to the fire location. The Storm Prediction Center (SPC) issues national outlooks identifying critical fire weather patterns.

Locally, NWS forecasters produce a meteorologically consistent gridded forecast database, including fire weather parameters. From this database, fire weather zone forecasts are issued for pre-suppression planning and for the National Fire Danger Rating System (NFDRS).

Customer and Partner Requirements

- ✓ Deliver probabilistic outlooks for critical fire weather patterns (days 2-7).
- ✓ Distribute smoke management information.

- ✓ Generate high-resolution forecast/model grids for input into fire behavior/fire danger tools.

Link to Science and Technology Infusion Plan

The 10-year goal of Fire Weather Services is to improve on-site and site-specific wildland fire support capabilities and to provide probabilistic weather information for enhanced planning and decision making. Better on-site and site-specific support will include improved fire-scale observations, higher-resolution fire weather modeling, and routine verification of products and services.

Product and Service Changes

- ✓ Develop Relative Humidity (RH), Transport Wind, and Mixing Height as experimental NDFD grid elements.

Science and Technology Requirements

- ✓ Deliver probabilistic forecast information for resource decision making.
- ✓ Run mesoscale model forecasts for active fire areas.



- ✓ Investigate methods to “push” digital forecast data into land management agency decision support systems.

Performance Measures

Performance measures in Fire Weather services have traditionally been recorded in the fire-prone western

U.S. The Fire Weather program has recently been expanded in the NWS, and new national baseline measurements of warning and watch parameters will be developed over the next few seasons. Until new baselines are produced, performance measures will be based on numbers from the western U.S.

Fire Weather Performance Measures

| Measure | 1999 - 2003 baseline | FY 2004 | FY 2005 |
|------------------------------------|----------------------|-----------|-----------|
| Red Flag Probability of Detection* | 89% | 90% | 91% |
| Red Flag Lead Time* | 9.2 hours | 9.3 hours | 9.4 hours |

* Based on western U.S. performance only.

Note: National baselines are currently being developed for Red Flag Warnings. In 2003, the first year the national statistics were produced, the national Probability of Detection was 86 percent and the lead time was 7.6 hours. After 3 years of national performance results have been accumulated, the performance measures will be adjusted and national numbers will be used.

Milestones by Quarter

1st Quarter

- Develop Fire Weather Concept of Services.
- Develop requirements and concept of operations for the Next Generation All Hazards Meteorological Response System (NEXAMRS).
- Conduct 3rd annual Fire Weather Program Manager’s Meeting.

2nd Quarter

- Develop Fire Weather Center Concept of Operations and Services.
- Develop new initiatives related to probabilistic fire weather forecasts, gridded NFDRS forecasts, extending NFDRS forecasts to 7 days, extended spot forecast, and gridded forecasts by IMET on site for input to fire behavior models.

3rd Quarter

- Initiate verification program for NFDRS forecasts.
- Conduct Incident Meteorologist Workshop.
- Integrate the NWS Spot Forecast Program into AWIPS, providing high resolution first guess fields from forecaster-produced grids.

4th Quarter

- Gain other agency support for Fire Weather Center Concept of Operations and Services.

Integrated Requirements

- ✓ Improve integration of Remote Automatic Weather Stations (RAWS) observations into the AWIPS system.
- ✓ Integrate NWS Spot Forecast system into AWIPS to maximize advantages of digital forecast databases.

Outreach

Fire Weather Services are actively involved with customers at the national and local levels. NWS will participate in several national interagency working teams in 2005 including:

- ✓ Fire Danger Working Team
- ✓ Fire Weather Working Team
- ✓ Predictive Services Working Group

These teams discuss and work on national issues related to fire danger, fire weather, and fire behavior. At the local level, most WFOs with fire weather programs will meet with customers twice during the next year.

Verification

Verification measures in Fire Weather have been sporadic and focused primarily on the fire-prone western U.S.. In 2004, the requirements were developed to add verification data for Red Flag Warnings and Fire Weather Watches to the national baselines.

By 2006, the baseline will be used to adjust national performance measures. Requirements for generating baselines for NFDRS for temperature, relative humidity, and wind will be documented.

Regional Initiatives

Southern

- ✓ Develop regional strategic plan for fire weather.

Western

- ✓ Develop prototype of format to prepare a fire weather forecast for a large National forest using gridded data from multiple WFOs.
- ✓ Test Web-based EMWIN as a means to relay all weather warnings to wildland fire agencies at selected WFOs.
- ✓ Develop a baseline for lead time of Red Flag Warnings for dry thunderstorms.
- ✓ Conduct a Web-based customer survey of fire weather customers.
- ✓ Test addition of non-Red Flag critical weather headlines to Fire Weather Zone forecasts at selected WFOs.
- ✓ Test EWARN as a means to relay weather warnings to fire weather customers at one or more WFOs.

Contact Information

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david.billingsley@noaa.gov.



NOAA Incident Meteorologist Chuck Redman assembles Fire RAWS Surface Observing Station in Utah.

Health Weather Services

Vision

To mitigate adverse impacts on public health from weather related phenomena such as air pollution, temperature extremes, ultra-violet (UV) radiation, and hazardous material releases.

Concept of Operations

The NWS will collaborate with public and private sector organizations, academia, the medical community, and the media to create and deliver new and enhanced health weather services by the following:

- ✓ Provide homeland security support by running air dispersion models at NCEP.
- ✓ Provide air quality, UV radiation, and temperature extreme information to the public, the medical community, and public agencies to reduce the economic cost of weather-related ailments.
- ✓ Educate the American public and medical community about air quality (AQ), temperature extremes, and UV radiation phenomena to reduce associated human costs.

Customer and Partner Requirements

- ✓ Provide meteorological support to the Department of Homeland Security and other Federal agencies.
- ✓ Distribute air dispersion model forecasts for hazardous material releases in support of peace-time emergency operations and terrorist attacks.
- ✓ Develop and implement a national AQ forecast system.
- ✓ Develop and implement a national Heat Health Warning System (HHWS).
- ✓ Develop an excessive heat response program guidebook in collaboration with the Environmental Protection Agency (EPA) and Centers for Disease Control and Prevention.
- ✓ Distribute timely and accurate forecasts to warn the public of excessive heat and extreme wind chill events.
- ✓ Generate and disseminate timely and accurate UV radiation forecasts.
- ✓ In collaboration with the Environmental Protection Agency (EPA), other federal and state agencies, and the private sector, develop and implement a UV Advisory System to warn Americans of anomalously high UV radiation events.
- ✓ Reduce the economic impact of health weather related phenomena.



Air Quality Performance Measures

| Measure | FY 2003 | FY 2004 | FY 2005 |
|---------------------|-------------------------|--------------------------|----------------------------------|
| Ozone Concentration | Estimated 85% accurate* | Estimated 90% accurate** | 90% accurate, national (goal)*** |

* Forecasts made with no air quality model.

** In 2004, data was collected from a limited domain with an experimental model.

*** In 2005, data will be collected from a domain covering parts of the eastern U.S., and it will be used to establish a national baseline for AQ forecast accuracy.

Link to Science Technology Infusion Plan

AQ research and development is a joint collaboration between the EPA and Office of Atmospheric Research's (OAR) Air Resources Laboratory (ARL). This initial capability is a result of refinements to testing in the summers of 2003 and 2004. Improvement in forecasting critical ozone threshold values over day-to-day persistence (approximately 85 percent) is expected.

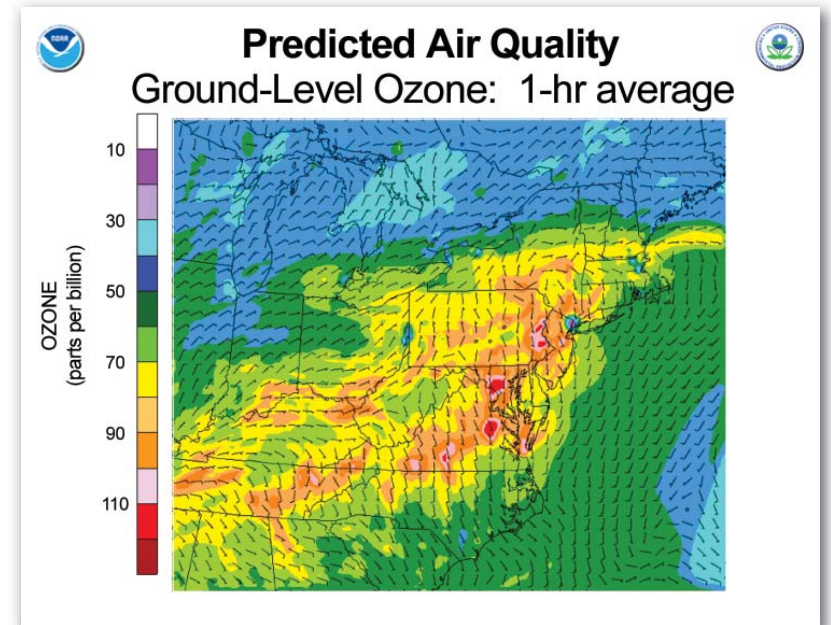
The AQ vision in the STIP is to distribute accurate warnings of poor air quality an average of 4 days or more in advance nationwide. These forecasts would alert the elderly and other at-risk people to limit their outdoor activities. AQ forecasts could also assist the medical community. Accurate forecasting could influence Emergency Room (ER) staffing and the monitoring of individuals with asthma and allergies. Moreover, it could potentially prevent or reduce ER visits, helping hospitals run more efficiently. Power companies and industry could shift to cleaner fuels, and the public could shift to mass transit or limit automobile use.

Product and Service Changes

- ✓ Continue testing experimental and developmental domains of the AQ forecast system. If feasible, implement an operational version.
- ✓ Modify time-to-frostbite shading on wind chill chart.
- ✓ Develop additional products to support homeland security, as needed.

Science and Technology Requirements

- ✓ Continue testing and evaluating Eta 12/Community Model for Air Quality (CMAQ) to improve surface ozone concentration forecasts.
- ✓ Run ensemble high-resolution window to support Homeland Security and fire weather applications.
- ✓ Modify time-to-frostbite shading requirement on wind chill chart, based on recent Canadian human testing.



Sample air quality forecast guidance of 1-hour average ozone levels at the surface generated by the NOAA / Environmental Protection Agency (EPA) Air Quality Forecast Modeling System. Ozone levels are shown in color contours; surface wind forecasts are also displayed for the given forecast hour.

Milestones by Quarter

1st Quarter

- Conduct Air Quality Constituent Workshop.

2nd Quarter

- Present updates on HHWS and UV Advisory activities at annual AMS meeting.
- Develop HHWS for additional U.S. cities, if funding is made available.

3rd Quarter

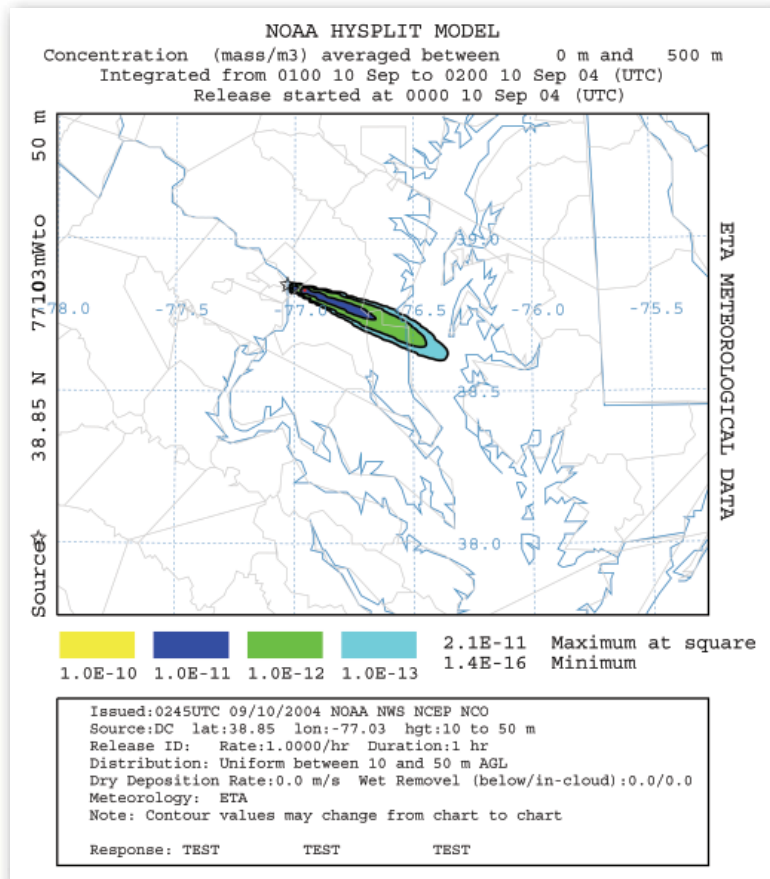
- Implement HHWS for additional U.S. cities, if funding is made available.
- Run expanded experimental AQ product.

4th Quarter

- Conduct an AQ Focus Group Workshop.
- Implement updated time-to-frostbite shading on wind chill chart.

Integrated Requirements

- ✓ Develop homeland security product suite to access and display critical data sets in the watch/warning/advisory application.



Sample hazardous material plume generated by the NOAA HYSPLIT model using Eta-12 meteorological input. Contours represent 1-hour concentrations within 500 meters of the ground for a release at the site denoted by a star.

Outreach

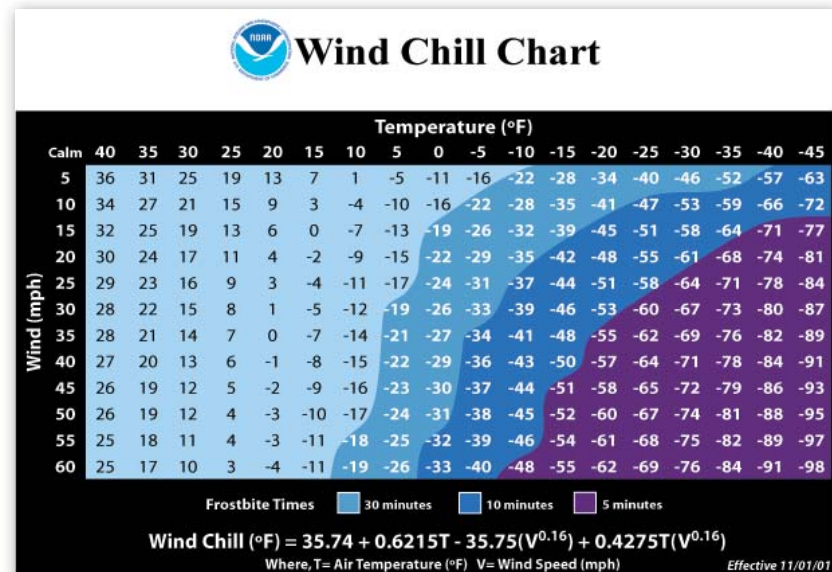
- ✓ Continue interactions with AQ focus group to provide feedback to modelers and AQ researchers to correct and improve model performance.
- ✓ Conduct presentations on AQ Forecast System at National AQ Workshops and AMS convention.
- ✓ Deliver presentations on Heat Health Warning Systems at AMS venues.
- ✓ Develop an excessive heat response program guidebook for interested public officials.
- ✓ Train participating WFOs on utilizing new HHWS.
- ✓ Present updates on UV radiation program activities at AMS and NWS partners meetings.
- ✓ Continue interacting with the Department of Defense (DoD), Department of Homeland Security, Department of Energy (DOE), Nuclear Regulatory Commission (NRC), and the other Federal and state agencies involved in homeland security at meetings and workshops.

Verification

- ✓ Develop simple grid verification using states' emissions monitoring data for ozone collection by EPA.

Contact Information

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NOAA's NWS Wind Chill Temperature (WCT) utilizes the latest advances in science, technology, and computer modeling to more accurately calculate how wind and air temperature combine to feel on human skin. The WCT is used in Canada and the United States, thereby standardizing the WCT for all of North America. For more information about WCT, visit <http://www.nws.noaa.gov/om/windchill/>.

Hydrologic Services

Vision

To provide water information for life's decisions for protecting life and property and ensuring the Nation's economic well-being.

Concept of Operations

The Advanced Hydrologic Prediction Service (AHPS) infuses new science and technology into operations, and is the cornerstone of the NWS Hydrologic Services modernization. AHPS will enable the NWS to provide improved river and flood forecasts and water information, to meet our mission and the changing needs of our partners and customers.

In 2005, the NWS plans to implement basic AHPS services at an additional 386 forecast points, bringing the total number to 1,522 forecast locations.

In addition, the NWS will continue to enhance standardized AHPS products and information available from the Internet.

These enhancements will facilitate the following:

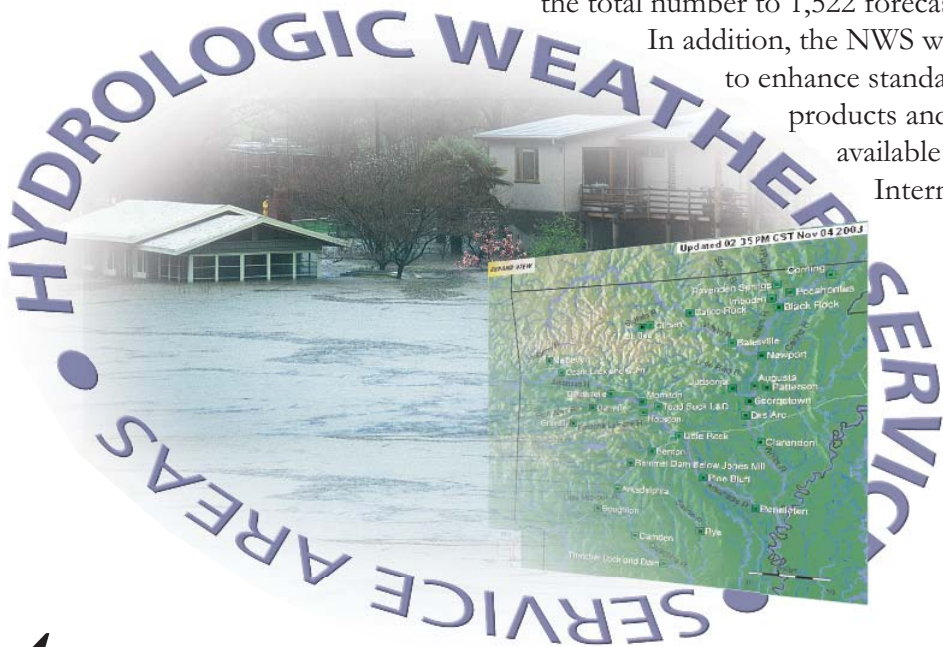
- ✓ Improved forecast accuracy.
- ✓ More specific and timely information on fast-rising floods.
- ✓ Additional types of forecast information.
- ✓ Longer forecast horizons.
- ✓ Products in more user-friendly formats, including graphics.
- ✓ More timely and consistent products and information.
- ✓ Expanded outreach.

The full Concept of Services and Operations for AHPS can be found at <http://www.nws.noaa.gov/om/water/AHPSconcept.pdf>.

Customer and Partner Requirements

The following items are identified as customer needs:

- ✓ Deliver probabilistic information to support risk-based decisions.
- ✓ Present flood-related information, including time of crest and category of flooding, in a simple, standardized format.



- ✓ Generate visually oriented products, including hydrographs, graphical depiction of areas covered by flood watches and warnings, graphical representation of flood severity categories, and flood forecast inundation maps.

- ✓ Generate daily, gridded National Operational Hydrologic Remote Sensing Center (NOHRSC) National Snow Analysis (NSA) products at one square kilometer resolution over the continental U.S. (CONUS) to be ingested into NDFD for water year 2005 (Oct. 1, 2004 - Sept. 31, 2005).

Link to Science and Technology Infusion Plan

The 10-year goal of the Hydrologic Services Program is to increase the average flash flood warning lead time to 60 minutes, and reduce warning areas to specific portions of counties. For river floods, the 10-year goal is to increase the average warning lead time to 12 hours.

These warning schedules should allow time for orderly evacuations and for emergency managers to take action to mitigate damage to communities.

- ✓ Deliver daily gridded products including snow water equivalent, snow depth, mean snowpack temperature, snow surface sublimation, snowmelt, and snow/non-snow precipitation.

GPRA Performance Measures

Flash floods are the most destructive and life-threatening type of flooding. Flash floods occur within hours after heavy rainfall and typically provide little time to respond. The hydrologic services GPRA goals concentrate on increasing advanced warning for these devastating events.

Product and Service Changes

- ✓ Implement AHPS services at an additional 386 forecast points.
- ✓ Enhance AHPS products and information available via the Internet in a standardized format.
- ✓ Implement VTEC in all Flood Watch and Warning products.
- ✓ Standardize the format for site-specific Flood Warning (FLW) products.

| GPRA Goal | FY 2003 | FY 2004 | FY 2005 |
|---|------------|------------|------------|
| Flash Flood Warning (FFW) Probability of Detection | 87% | 88% | 89% |
| Lead Time | 47 minutes | 50 minutes | 53 minutes |
| Precipitation Forecast Day 1 Threat Score* | 25 | 25 | 27 |

* The Threat Score is defined as the number of correct forecasts divided by the total number of correct forecasts plus the number of wrong forecasts for precipitation one inch or greater in a 24 hour period.

Milestones by Quarter

1st Quarter

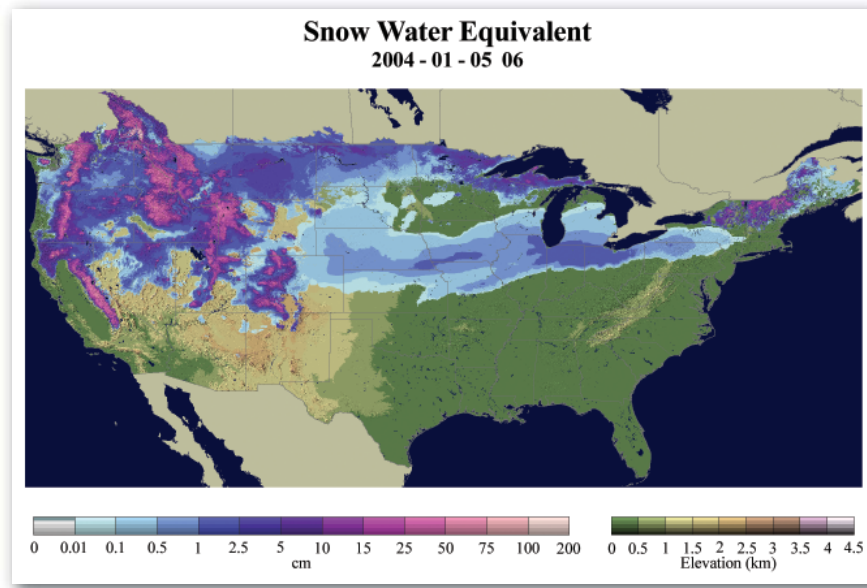
- Modify and certify new NOHRSC Turbo Commander snow survey aircraft mission-ready.
- Develop documentation for AWIPS Operational Build 4 (OB4) hydrologic application enhancements.
- Conduct second biennial National Hydrologic Program Managers (HPM) Conference.
- Modify the Integrated Flood Observing and Warning System (IFLOWS) grants process from an institutional to a competitive solicitation.

2nd Quarter

- Complete annual flood loss summary.
- Make airborne snow water equivalent measurements over CONUS and Alaska.
- Report airborne data in alphanumeric and map format over AWIPS and the NOHRSC Web site in near real time.
- In cooperation with the National Safety Council (NSC), produce, distribute, and provide Internet access to flood safety brochures.
- Update the Web-based AHPS Information Tool Box.

3rd Quarter

- Prepare national hydrologic assessment in support of the NOAA spring press briefing.
- Develop documentation for AWIPS Operational Build 5 (OB5) hydrologic application enhancements.
- Deploy software to establish and maintain an integrated national river forecast location database.
- Implement technology to process and distribute IFLOWS gauge data at a central facility to improve data availability.
- Expand the number of forecast point locations in the River Forecast Center (RFC) verification database.



Snow water equivalent from the National Snow Analysis.

4th Quarter

- Collect background terrestrial gamma radiation data to calibrate new flight lines as requested by RFCs.
- Provide operational, Web-based, NOHRSC NSA products and data sets in map, alphanumeric, time-series, text discussion, and gridded formats for CONUS during the water year (Oct. 1, 2004 - Sept. 31, 2005).
- Conduct a National Senior Hydro-meteorological Analysis and Support (HAS) Forecaster Conference.
- Deploy the initial version of a Web-based graphical user interface for the national river forecast location database.
- Implement a national flood warning verification system.
- Implement a gridded NDFD QPF Verification System.

Integrated Requirements

The following three capabilities will become available through AWIPS in 2005:

- ✓ Generate improved site-specific hydrologic forecasting capabilities for small, headwater basins.
- ✓ Deliver product formatters capable of including VTEC data in hydrologic products.

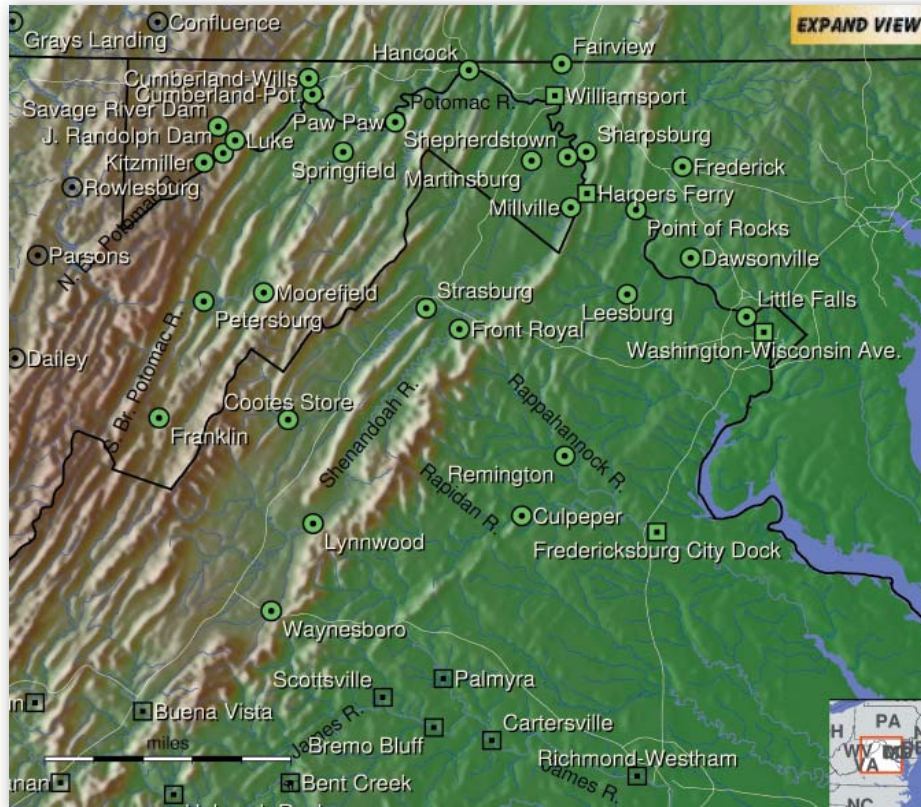
- ✓ Develop an initial distributed model capability for selected RFC basins, which will enable the generation of higher resolution forecast information.

Outreach

OCWWS Hydrologic Services will participate in meetings with the following groups:

- ✓ U.S. Geological Survey
- ✓ National Resources Conservation Service
- ✓ Advisory Committee on Water Information's Subcommittee on Hydrology
- ✓ National Hurricane Conference
- ✓ NOAA Hurricane Conference
- ✓ Interdepartmental Hurricane Conference
- ✓ Interagency Coordinating Committee on Hurricanes
- ✓ National Safety Council
- ✓ Association of State Flood Plain Managers
- ✓ National Hydrologic Warning Council

- ✓ Southwest Association of Alert Users
- ✓ IFLOWS Users Group
- ✓ FERC Dam Safety Council



Standard AHPS map depicting river forecast locations and river status for central and western Maryland, eastern West Virginia, and northern and central Virginia. To view this interactive map, visit <http://ahps.erh.noaa.gov/cgi-bin/ahps.cgi?lwx>.

Verification

Verification statistics have been generated routinely for Flash Flood Warnings (FFW) since 1986. Since the spring of 2001, verification statistics have been generated for RFC forecasts at a subset of forecast points. The number of verified RFC forecast points will be expanded, and the NWS will begin verifying Flood Warnings issued by WFOs.

Regional Initiatives

NWS Regions will implement basic AHPS services at an additional 386 river forecast points throughout the continental United States and Alaska, and will work with NWS Headquarters personnel to achieve the milestones.

Contact Information

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Marine Weather Services

Vision

To meet safety needs through ready access to accurate, timely, easily understood, and technologically advanced products, forecasts, and warnings.

Concept of Operations

Development will continue for AWIPS and the National Center Advanced Weather Interactive Processing System (NAWIPS). These critical systems will provide new, enhanced capabilities, and new data sets to support marine and tropical product generation. New science and technology plans will be implemented to increase forecast and warning accuracy and to meet our customer needs for ready access to easily understood information.

Planned activities will focus on three areas:

- ✓ Enhanced operational services, with emphasis on gridded and graphical products.
- ✓ Improved marine forecast process.
- ✓ An active customer outreach program.

Customer and Partner Requirements

Marine and Coastal Services

- ✓ Integrate National Ocean Service (NOS) Physical Oceanographic Real Time System (PORTS) data with weather information and forecasts.

- ✓ Issue swell direction and period forecasts for coastal, offshore, and high-seas marine zones.
- ✓ Issue wave direction forecasts for the Great Lakes.
- ✓ Issue probabilistic confidence level of marine forecasts.
- ✓ Provide early and accurate port or harbor specific forecasts and warnings.
- ✓ Expand marine-only weather radio.
- ✓ Generate regularly spaced grid of marine observations in all coastal and offshore areas and Great Lakes.
- ✓ Integrate observations for wave period and visibility and swell height, direction, and period.

Tropical Cyclone Services

- ✓ Increase accuracy of tropical cyclone forecasts of track and intensity.
- ✓ Improve storm surge forecasts.



- ✓ Increase accuracy of 34-, 50- and 64-knot wind radii forecasts.
- ✓ Improve tropical cyclone quantitative precipitation estimates.

Link to Science and Technology Infusion Plan

Marine Weather Services

Marine Weather Services support the NOAA mission by providing current and accurate information for marine and coastal interest. This information assists U.S. coastal waters, open oceans, and the Great Lakes. These warnings ensure the safety of life and protection of property. This effort increases marine wind and wave forecast skills, toward fulfilling the STIP goals.

GPRA Performance Measures

| GPRA Goal | FY 2003 | FY 2004 | FY 2005 |
|---|--------------------|--------------------|--------------------|
| Hurricane Forecast Track Error | 130 nautical miles | 129 nautical miles | 128 nautical miles |
| Marine Wind Speed Forecasts - Accuracy* | 0.54 | 0.57 | 0.60 |
| Marine Wave Height Forecasts - Accuracy* | 0.66 | 0.69 | 0.72 |

* The Equitable Skill Score measures the skill of forecasts with an emphasis on "extreme events".

Tropical Cyclone Services

Tropical Cyclone Services supports the vision of providing timely and accurate tropical cyclone products by using cutting edge technology in a cost effective manner, improving the economic value of tropical cyclone information, decreasing tropical cyclone related fatalities, and fulfilling the STIP goal of decreasing the 48-hour mean track error.

Product and Service Changes

- ✓ Release Graphical Hurricane Local Statement (HLS) at <http://products.weather.gov/>. Gather customer feedback.
- ✓ Develop Graphical Hazardous Weather Outlook. Solicit customer feedback beginning April 2005.
- ✓ Issue experimental Marine Point Matrices. Solicit customer feedback through July 2005.

Science and Technology Requirements

- ✓ Provide capability for intersite coordination of WFO-generated gridded forecasts on AWIPS between the Ocean Prediction Center (OPC) and the Tropical Prediction Center (TPC).
- ✓ Continue NCEP development of Great Lakes Wave Model to support WFO marine product generation.
- ✓ Provide gridded guidance of height, period, and direction for additional wave fields.

Milestones by Quarter

1st Quarter

- Implement new guidance products on AWIPS including National Ice Center (NIC) ice edge analyses and sea surface temperatures.

3rd Quarter

- Develop prototype for tropical cyclone hazards graphic.
- Expand tropical cyclone preparedness activities.
- Broaden public education and awareness through key rip current partnerships and activities.

4th Quarter

- Conduct an assessment of NWS capabilities to support United States Coast Guard (USCG) emergency operations.
- Standardize marine Internet page presentations.

Integrated Requirements

The following five changes will occur in AWIPS:

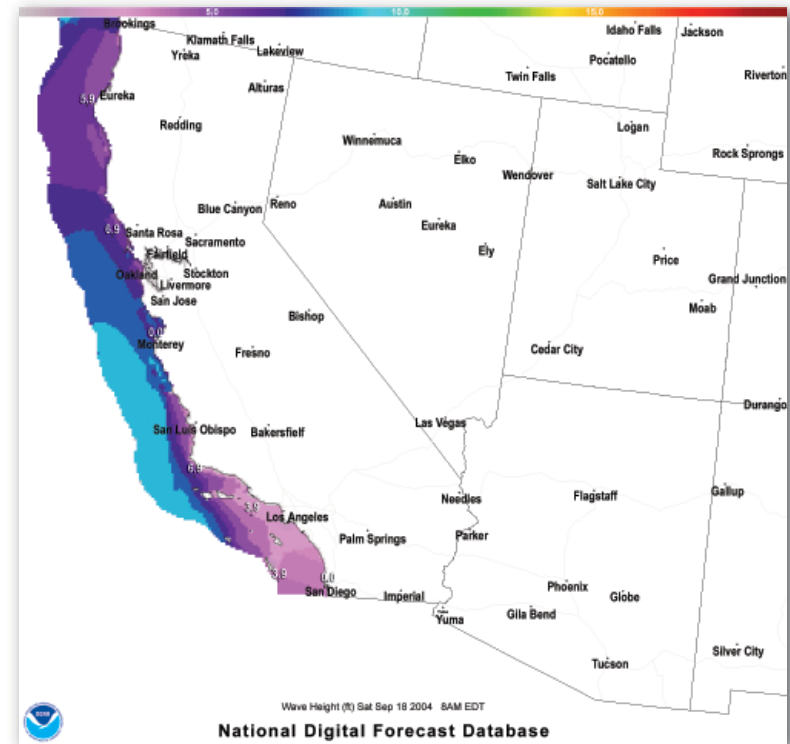
- ✓ Implement system on AWIPS for Forecasting and Evaluation of Seas and Lakes (SAFESEAS) fog monitoring tool.
- ✓ Include Short Range Ensemble Forecast (SREF) model guidance.

- ✓ Integrate Special Sensor Microwave/Imager (SSM/I) derived wind analyses.
- ✓ Incorporate Fleet Numerical Meteorology and Oceanography Center (FNMOC) Wave Watch III model guidance.

- ✓ Include Navy Operational Global Atmospheric Prediction System (NOGAPS).

Outreach

- ✓ Attend annual marine and tropical cyclone customer and partner meetings.
- ✓ Attend town meetings at boat and trade show events.
- ✓ Distribute rip current outreach and educational materials and events.
- ✓ Sponsor Hurricane Awareness Week.
- ✓ Participate in National Safe Boating Week.
- ✓ Write articles for marine-related magazines.



Example of experimental significant wave height graphic showing the California coastline

Verification

In 2005, the Marine Weather Services will begin verifying the marine forecaster edited model grids to take marine from point to areal verifications.

Today, the Marine Services Program compares a point observation from a marine weather station (such as a buoy) against the most recent forecast for that station to measure performance. Verifying the marine forecaster edited model grids over a marine area will compare the analyzed station observations against the most recent forecaster edited grids.

Regional Initiatives

Alaska

- ✓ Conduct an assessment of marine customer satisfaction through outreach forums.
- ✓ Evaluate the impact of marine observation systems on forecast operations.
- ✓ Enhance volunteer marine observation programs at the Weather Service Office (WSO) level.
- ✓ Investigate the feasibility of providing wave steepness forecasts for the Valdez Narrows.

Central

- ✓ Implement a marine storm and gale verification program.

- ✓ Continue partnership with the Great Lakes Environmental Research Laboratory (GLERL) to prototype and implement a system for forecasting gridded wave height and direction over the Great Lakes.
- ✓ Finalize implementation plan to expand the Great Lakes marine observation network and align forecast, research, verification, and monitoring requirements of the Great Lakes marine community.
- ✓ Support one Great Lakes marine workshop and one Great Lakes operational workshop.
- ✓ Continue NOS partnership to improve and expand the Great Lakes Marine Observing Network (MON) through judicious, acquiring, and siting of remote wind sensors.

Eastern

- ✓ Host Atlantic Hurricane Awareness Tour (HAT) at selected coastal locations.
- ✓ Coordinate at least one TPC/NHC hurricane forecaster office visit.
- ✓ Continue expansion and participation in the Rip Current Program to WFO New York City.
- ✓ Coordinate two forecaster exchanges between two coastal Eastern Region WFOs and NCEP/OPC.

Pacific

- ✓ Initiate a marine forecaster exchange to aide in backup procedures, and enhance new forecaster training techniques.
- ✓ Utilize gridded production software to produce WFO Honolulu's Offshore Waters Forecast (OFF).
- ✓ Rewrite *Mariner's Guide for Hurricane Awareness in the North Atlantic Basin* for Pacific Region customers.

Southern

- ✓ Conduct a marine forecaster workshop to enhance forecaster knowledge, training techniques and methodology.
- ✓ Investigate the feasibility and potential value of standardizing the context of the Surf Zone Forecast (SRF) product for customers and partners of marine services.
- ✓ Enhance and promote a consistent set of robust marine IFPS/GFE Smart-Tools used by forecasters to deliver gridded and graphical marine forecast services.
- ✓ Explore a collaborative, multi-agency effort with the Army Corps of Engineers to develop a local mesoscale model to improve marine forecast services in the coastal environment.
- ✓ Host Gulf Coast HAT at selected coastal locations.

Western

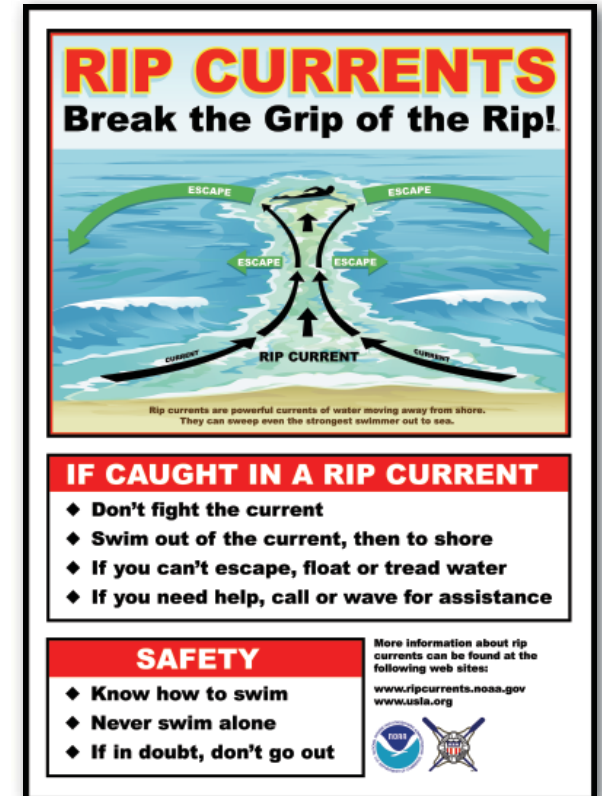
- ✓ Implement wave steepness as optional criteria for Small Craft Advisories for Hazardous Seas (SCAHS).
- ✓ Investigate development of a graphical version of the Wave Watch III text output bulletins; evaluate usefulness.
- ✓ Prototype operational bar harbor entrance forecast.

NWS/NCEP Tropical Analysis and Forecast Branch

- ✓ Conduct an assessment and evaluate customer feedback to reduce the number of marine zones in the Gulf of Mexico OFF product.

NWS/NCEP and OPC

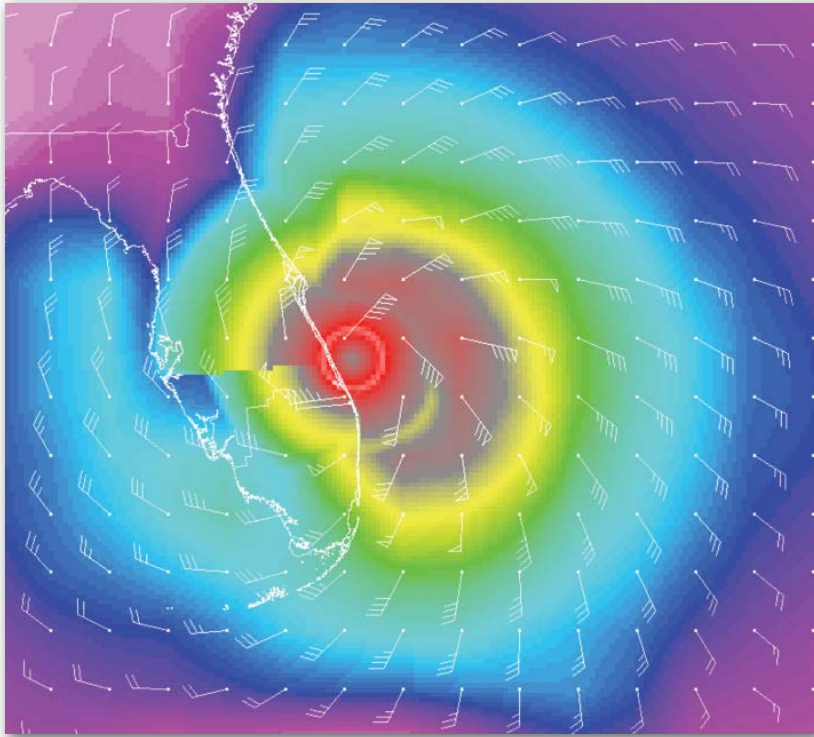
- ✓ Implement 24-hour forecast charts of 500 millibar heights for the Atlantic and the Pacific Oceans.
- ✓ Enhance synergy and expand efficiencies between the OPC and the TAFB.
- ✓ Produce for evaluation a sample set of OPC products, in gridded format, to support customer and partner requirements of marine services.
- ✓ Initiate a collaboration process with the WFOs to explore medium-range forecast guidance for coastal and offshore areas of responsibility.



NOAA's rip currents sign, for posting along beach fronts, by state and local municipalities.

NCEP TPC/NHC

- ✓ Add National Hurricane Center (NHC) historical forecast verification information to the NHC Web page.
- ✓ Decide on operational implementation of second-round U.S. Weather Research Program (USWRP) Joint Hurricane Testbed (JHT) projects with 1-year duration.
- ✓ Conduct three Introduction to Hurricane Preparedness Workshops for local emergency managers.
- ✓ Conduct a hurricane awareness tour to Caribbean countries and Mexico, and a tour along the U.S. Atlantic, with emphasis on outreach and public education.
- ✓ Conduct an international Regional Area IV Workshop on hurricane forecasting and warning for meteorologists.
- ✓ Complete selection process and second round testing, then begin third round of testing for USWRP/JHT projects.
- ✓ Test and evaluate an experimental Tropical Cyclone VTEC (TCV) watch and warning product in coordination with NWS OST and NCEP Computing Development Branch (CDB).
- ✓ Test experimental gridded wind speed probability product for tropical cyclones.



Gridded wind field around hurricane Frances, illustrating the large swath of tropical cyclone winds over the state of Florida.

Contact Information

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Observation Services

Vision

To set policy, develop procedures, and articulate requirements for the maintenance and enhancement of in-situ and remote environmental monitoring.

Concept of Operations

The Cooperative Observer Network (COOP) and the radiosonde network are being modernized. Activities include replacing the current 91-station upper air network and enhancing 8,000 cooperative observing stations over the remainder of the decade.

As part of a demonstration pilot in New England, about 400 COOP stations are scheduled to be modernized. Modernizing NWS-sponsored observing programs involves integrating new technologies and science, while building stronger relationships with NOAA's public and private sector partners.

Customer and Partner Requirements

- ✓ Real-time access to ASOS data and COOP data.
- ✓ Access to mesonet data.
- ✓ Access to high-resolution data.

Link to Science and Technology Infusion Plan

The future for Observing Services includes:

- ✓ AQ sensors
- ✓ Boundary layer profilers
- ✓ Advancements in communications
- ✓ More detailed aircraft meteorological reports
- ✓ Increased capacity of satellite reports
- ✓ Use of GPS
- ✓ Improved GPS radiosonde measurements
- ✓ Improved use of surface transportation sensors



Science and Technology Requirements

- ✓ Continue data assimilation.
- ✓ Generate ocean atmosphere model resolution and mesoscale physics.
- ✓ Couple mesoscale ocean and atmospheric Numerical Weather Prediction (NWP) models.
- ✓ Expand targeted observations.
- ✓ Produce high-resolution modeling at the land surface.



Climate Reference Network station in New England utilizes the same sensors as COOP modernization stations.

Milestones by Quarter

1st Quarter

- Deploy 20 radiosonde replacement systems.
- Begin planning for the next phase of COOP deployments.
- Prepare a white paper defining training needs for the legacy and modernized COOP networks.
- Implement the new COOP Length of Service award process.
- Implement new snow-paid observers.
- Complete Memorandum of Agreement with FAA on transition of aviation weather observing support activities.

2nd Quarter

- Finalize Global Climate Observing System (GCOS) metadata for NWS upper air network stations.
- Revise GCOS Global Upper Air Network (GUAN) sites and CLIMAT data implementation.
- Reestablish National COOP newsletter.
- Develop training materials on Fischer & Porter upgrade.

3rd Quarter

- Review the status of on going ASOS sensor continuity evaluations and prepare a report in coordination with NOAA's National Climate Data Center (NCDC).

4th Quarter

- Begin developing a series of training videos for COOP observers.
- Begin the Fischer & Porter continuity evaluation.

Integrated Requirements

- ✓ Graphic user interface in OB2.
- ✓ Local Data Acquisition and Dissemination (LDAD) capability to ingest mesonet data.

Data Assimilation

- ✓ Work with FSL to provide data collection capabilities.
- ✓ Provide improved interim data assimilation for COOP data.
- ✓ Secure National support for the Central Region Weather Coder II (WxCoder II) and Southern Region Interactive Voice Remote Observation Collection (IV-ROCS) system data assimilation solutions.

Outreach

- ✓ Participate in WMO Open Programme Area Groups (OPAG) for International Organizing Committee on Radiosonde Comparisons.
- ✓ Attend WMO International Radiosonde Comparison in Mauritius.
- ✓ Participate in May 2005 Commission for Instrument and Methods of Observation (CIMO) in Bucharest, Romania.
- ✓ Monitor radiosonde testing on regional and national levels and report to the WMO Technical Conference on Meteorological and Environmental Instruments and Methods of Observation (TECO).
- ✓ Develop procedures for the publication of results of WMO intercomparisons for inclusion in chapter 5 of the CIMO guide.
- ✓ Develop performance measures to demonstrate continuous improvement of data quality of radiosonde observations.

Verification

- ✓ Coordinate the process of using COOP data sites for temperature forecast verification.

Contact Information

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Public Weather Services

Vision

To satisfy customer and partner requirements for consistent, timely, and accurate weather services, products, forecasts, and warnings.

Concept of Operations

The public weather services program collaborates with NOAA offices, Government agencies, private sector organizations, and academia, to create new and enhanced weather services to improve performance for routine forecasts and tornado, severe thunderstorm, and winter storm warnings.

Customer and Partner Requirements

- ✓ Improve warning accuracy and lead times.

- ✓ Increase accuracy of forecasts.

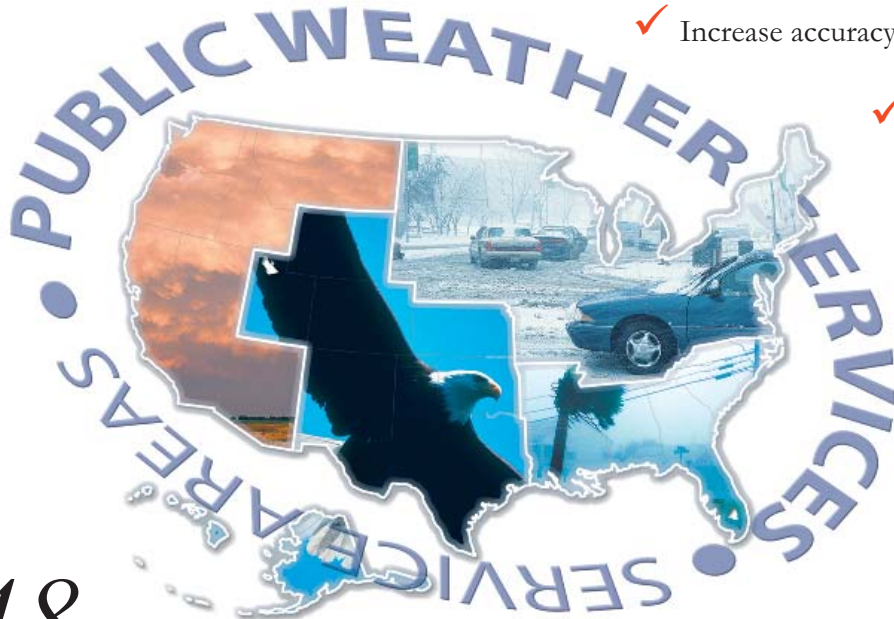
- ✓ Distribute severe weather warnings based on subcounty areas.

- ✓ Display information in new formats, including grids, graphics, and GIS.

- ✓ Communicate forecast uncertainty using probabilistic techniques.
- ✓ Increase frequency of forecast updates.
- ✓ Implement interactive forecast system where customers can produce user-defined, site-specific forecast information.
- ✓ Distribute computer-readable weather summaries.
- ✓ Generate Metropolitan Area Forecasts for use by commercial, public, TV, radio broadcasters, and emergency managers.
- ✓ Standardize headlines for winter weather and non-precipitation weather watch/warning/advisory text products.

Link to Science Technology Infusion Plan

Severe weather research and development are directly tied to GPRA performance measures. The Open Systems architecture upgrade to the Radar Data Acquisition platform will begin in FY 2005 and finish in FY 2006.



Product and Service Changes

- ✓ Implement a segmented severe weather statement format.
- ✓ Implement new convective watch product suite.
- ✓ Discontinue legacy convective watch product suite.
- ✓ Deploy interactive user-defined, site-specific forecast.

Science and Technology Requirements

- ✓ Plan transition to Weather Research and Forecast (WRF) model.
- ✓ Implement model upgrades, including changes to Short-Range Ensemble Forecasts (SREF) and Medium-Range Ensemble Forecasts (MREF).
- ✓ Improve assimilation and subgrid-scale orographic forcing schemes in mesoscale and global forecast systems.

Milestones by Quarter

1st Quarter

- Develop plan for a new GPRA measure based on ACSI results.
- Present public weather service update briefing at NWA annual meeting.

GPRA Performance Measures

| GPRA Goal | FY 2003 | FY 2004 | FY 2005 |
|---|------------|------------|------------|
| Tornado Warning, Accuracy | 72% | 72% | 73% |
| Tornado Warning, Lead Time | 12 minutes | 12 minutes | 13 minutes |
| Tornado Warning, False Alarm Ratio | 72% | 70% | 69% |

| GPRA Goal | FY 2003 | FY 2004 | FY 2005 |
|--|----------|----------|----------|
| Winter Storm Warning, Lead Time | 13 hours | 14 hours | 15 hours |
| Winter Storm Warning, Accuracy | 88% | 89% | 90% |

- Establish national standard for interactive forecast services.
- Develop operational requirements for Next Generation Warning Tool.
- Implement a segmented severe weather statement format.
- Implement headline standardization in winter weather and nonprecipitation weather watch/warning/advisory text products.

2nd Quarter

- Implement VTEC in public weather watch, warning, and advisory text products.
- Conduct 4th Annual Severe Weather Program Managers meeting.
- Implement trial program at designated WFOs to issue winter weather warnings and advisories based on local impact and quantitative threshold criteria.
- Develop polygon-based warnings program plan.
- Implement new convective watch product suite.
- Discontinue legacy convective watch product suite.

- Present public weather service update briefing at NWS Partners Workshop.

3rd Quarter

- Conduct 4th Annual Public Weather Program Managers meeting.
- Present public weather service update briefing at AMS Broadcasters Conference.

4th Quarter

- Develop Metropolitan Area Forecasts.
- Improve assessment of Winter Weather Program.
- Establish national standard for COOP observations.
- Establish national standard for sub-Local Storm Reports (LSRs).
- Include quantitative precipitation forecast in text-based products.
- Develop 7-day “Stats-on-Demand” for point forecast matrix elements.



NWS Meteorologists looking at radar and satellite imagery and forecast model displays on an AWIPS workstation.

Integrated Requirements

- ✓ Produce baseline product formatters for products specified in NWS Instruction 10-503.
- ✓ Develop system for Convective Analysis and Nowcasting.

Outreach

- ✓ Present Watch by County and Short Duration Warning Quality Control briefings at NWA and AMS conventions and at the annual National Severe Weather Workshop.
- ✓ Present public weather service update briefings at NWA, AMS Broadcasters Conference, and IAEM annual meetings.
- ✓ Host the Severe Weather Program Leaders Meeting, prior to the National Severe Weather Workshop.

Verification

- ✓ Develop and implement verification for winter weather watches and event-specific winter weather warnings.
- ✓ Begin verification development of other forecast elements, including cloud amount, snow amount, wind speed and direction, and precipitation type.
- ✓ Start developing polygon verification for severe thunderstorms and tornadoes.

Regional Initiatives

Alaska

- ✓ Host and report on a post-season winter weather workshop.
- ✓ Increase understanding of extreme events through local studies and post-event analysis.
- ✓ Expand use of all-season spotter networks.

Contact Information

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Space Weather Services

Vision

To provide the Nation with critical space weather services to protect life and property in space, in the air, at sea, and on land.

Concept of Operations

NWS provides real-time monitoring and forecasting of solar and geophysical events, develops techniques for forecasting solar and geophysical disturbances, and conducts applied research in solar-terrestrial modeling and physics. All of these activities are coordinated to deliver timely, accurate, and relevant information to the users of space weather products and services.

Customer and Partner Requirements

- ✓ Critical U.S. energy infrastructure including electric power grids.
- ✓ On-orbit satellite operations, including energy systems and computers.
- ✓ Telecommunications and GPS interests.
- ✓ Health and safety of astronauts, aviators, flight crews, and passengers.

Link to Science and Technology Infusion Plan

Space weather services leverage science and technology initiatives to increase the detection of events and the accuracy, specificity, and lead time of solar and geomagnetic forecasts. These advances in detection and warnings facilitate effective planning and decision making. Space weather efforts will increase the data quality and long-term continuity of related observations.

Prototype models for transition into operations will be developed and tested. There will also be expanded content and coverage of information and services to space weather customers and partners.

2005 Changes

- ✓ Ingest and display Polar Operational Environmental Satellite (POES)-18 satellite Space Environment Monitor (SEM) data.
- ✓ Prepare subscription service to assimilate all customer data.
- ✓ Upgrade hardware and software of legacy ingest systems.
- ✓ Receive Geostationary Operational Environmental Satellites (GOES)-N satellite data, following the scheduled December 2004 launch.

Science and Technology Requirements

- ✓ Improve and validate observations for space weather.



- ✓ Transition research models, products, and data into space weather operations.
- ✓ Develop and maintain space weather data and product distribution systems.
- ✓ Ensure observations of space weather and solar variability meet requirements for assessing long-term space climatology and global climate change.

Performance Measure

| Measure | Baseline | FY 2004 | FY 2005 |
|--------------------------------|----------|---------|---------|
| Average ACE data availability* | 90% | 96% | 97% |

* A measure of the reception of data from the NASA Advanced Composition Explorer (ACE) satellite.

| Measure | Baseline | FY 2004 | FY 2005 |
|---|----------|---------|---------|
| Skill score for moderate geomagnetic storm warnings | n/a** | .50 | .52 |

** The skill score for geomagnetic storm warnings was established in FY 2004.

Milestones by Quarter

1st Quarter

- Transfer Space Environment Center (SEC) from the Office of OAR to NWS.
- Transition U.S. Total Electron Content (TEC) model into testbed.

2nd Quarter

- Transition planetary geomagnetic activity (A^P) prediction to testbed.
- Complete outer radiation belt electron loss study.

3rd Quarter

- Co-sponsor annual Space Weather Week in Boulder, CO.
- Prepare Webcast for WFOs about services to space weather customers.

4th Quarter

- Confirm and validate space weather data during post-launch test of GOES-N satellite.
- Implement operations of ground systems for GOES-N satellite data.
- Develop scientific training for NWS forecasters to facilitate their understanding of the potential impacts of space weather phenomena.

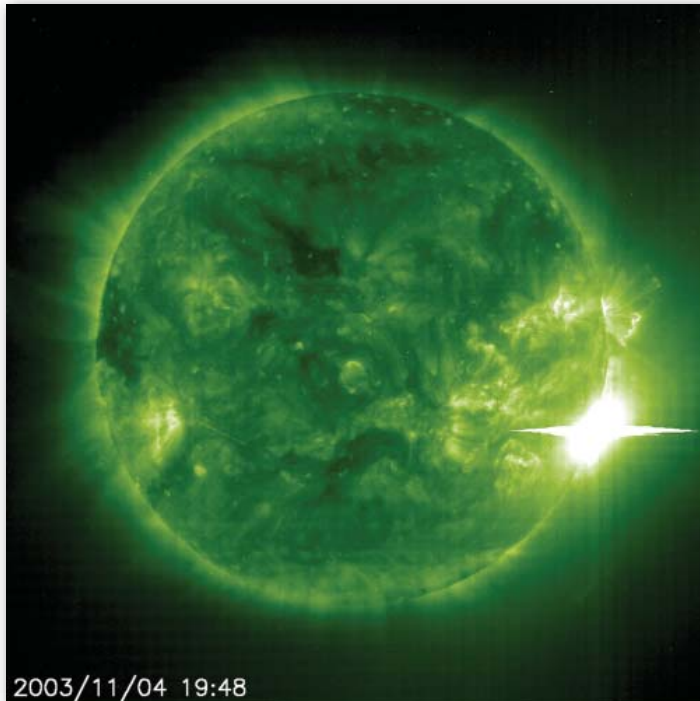


Photo: SOHO, NASA/ESA

The X-28 solar flare, which occurred November 4, 2003 over the western limb of the sun, is the largest and strongest solar flare observed to date.

Integrated Requirements

- ✓ Use SEC's current testbed to transition models developed with financial support from NSF, NASA, and DoD partners.
- ✓ Participate in the creation of a community-wide framework for space weather model development, similar to the Earth System Modeling Framework (ESMF).

Outreach

- ✓ Co-sponsor Space Weather Week in Boulder, CO.
- ✓ Participate in the second symposium on space weather at the 2005 annual AMS meeting in San Diego.
- ✓ Give tours of SEC facility to more than 150 students from the Boulder Valley School District.

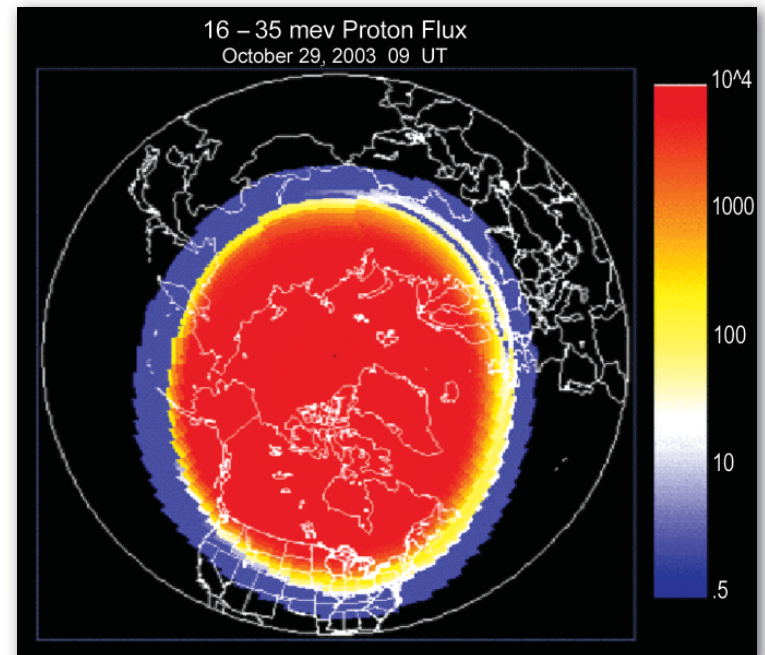
Verification

Forecasts and products are verified against actual events when events are forecast. Times and descriptions of events are compared to forecasts, and a statistical measure of accuracy is used. Verifications are updated regularly, and are available at http://www.sec.noaa.gov/forecast_verification/index.html.

Contact Information

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Polar region impacted by extreme level of solar particles during severe event of October 28-29, 2003. This image was extrapolated from NOAA POES satellite data. Extreme levels of energetic particles affect airlines and high latitude short-wave communications.

Acronym List

| | | | |
|---------------|--|--------------|---|
| AAWU | Alaska Aviation Weather Unit | COOP | Cooperative Observer Program |
| ACE | Advanced Composition Explorer | CPC | Climate Prediction Center |
| ACIS | Applied Climate Information System | CRM | Customer Relationship Management |
| ACSI | American Customer Satisfaction Index | CSI | Customer Satisfaction Index |
| AHPS | Advanced Hydrologic Prediction Service | CWSU | Center Weather Service Unit |
| ALDA | Association of Late Deafened Adults | DHS | Department of Homeland Security |
| AMS | American Meteorological Society | DLAC2 | Distance Learning Aviation Course 2 |
| AOC | Aviation Operations Course | DoD | Department of Defense |
| AOPA | Aircraft Owners and Pilots Association | DOE | Department of Energy |
| AQ | Air Quality | EAA | Experimental Aircraft Association |
| ARL | Air Resources Laboratory | EML | Environmental Modeling Center |
| ARTCC | Air Route Traffic Control Center | ENSO | El Niño Southern Oscillation |
| ASF | Air Safety Foundation | EPA | Environmental Protection Agency |
| ASOS | Automated Surface Observing System | ER | Emergency Room |
| ATA | Air Transport Association | ESMF | Earth System Modeling Framework |
| AvnFPS | Aviation Forecast Preparation System | FAR | False Alarm Rate |
| AWC | Aviation Weather Center | FCC | Federal Communications Commission |
| AWIPS | Advanced Weather Interactive Processing System | FFW | Flash Flood Warnings |
| AWRP | Aviation Weather Research Program | FIP | Forecast Icing Potential |
| CAP | Common Alerting Protocol | FLW | Flood Warning |
| CDB | Computing Development Branch | FNMOC | Fleet Numerical Meteorology and Oceanography Center |
| CDC | Climate Diagnostics Center | FSL | Forecast Systems Laboratory |
| CES | Consumer Electronics Show | FY | Fiscal Year |
| CFS | Climate Forecast System | GCOS | Global Climate Observing System |
| CIMO | Commission for Instrument and Methods of Observation | GFA | Graphical Area Forecast |
| CLI | Daily Climate Report | GIS | Geographical Information System |
| CMAQ | Community Model for Air Quality | GLERL | Great Lakes Environmental Research Laboratory |
| CONUS | Continental United States | | |

| | | | |
|----------------|--|----------------|--|
| GOES | Geostationary Operational Environmental Satellites | MOS | Model Output Statistics |
| GPRA | Government Performance and Results Act | MREF | Medium-Range Ensemble Forecasts |
| GPS | Global Positioning System | NAB | National Association of Broadcasters |
| GRIB | Gridded Binary | NAS | National Airspace System |
| GUAN | Global Upper Air Network | NASA | National Aeronautics and Space Administration |
| HAI | Helicopter Association International | N-AWIPS | National Center Advanced Weather Interactive Processing System |
| HAS | Hydrometeorological Analysis and Support | NBAA | National Business Aviation Association |
| HAT | Hurricane Awareness Tour | NCEP | National Centers for Environmental Prediction |
| HHWS | Heat Health Warning System | NDFD | National Digital Forecast Database |
| HLS | Hurricane Local Statement | NEMA | National Emergency Management Association |
| HPM | Hydrologic Program Managers | NEXAMRS | Next Generation All Hazards Meteorological Response System |
| IAEM | International Association of Emergency Managers | NFDRS | National Fire Danger Rating System |
| IATA | International Air Transport Association | NHC | National Hurricane Center |
| ICAO | International Civil Aviation Organization | NHWC | National Hydrologic Warning Council |
| IFLOWS | Integrated Flood Observing and Warning System | NIC | National Ice Center |
| IFPS | Interactive Forecast Preparation System | NLC | National League of Cities |
| IFR | Instrument Flight Rules | NOAA | National Oceanic and Atmospheric Administration |
| IMET | Incident Meteorologist | NOGAPS | Navy Operational Global Atmospheric Prediction System |
| IOC | Initial Operating Capability | NOHRSC | National Operational Hydrologic Remote Sensing Center |
| ISCS | International Satellite Communications System | NOS | National Ocean Service |
| IV-ROCS | Interactive Voice Remote Observation Collection | NRC | Nuclear Regulatory Commission |
| JHT | Joint Hurricane Testbed | NRP | National Response Plan |
| LCD | Local Climatological Data | NSA | National Snow Analysis |
| LDAD | Local Data Acquisition and Dissemination | NSC | National Safety Council |
| LSR | Local Storm Report | NSF | National Science Foundation |
| MADIS | Meteorological Assimilation Data Ingest System | NSIP | NWS Service Improvement Plan |
| MJO | Madden-Julian Oscillation | | |
| MON | Marine Observing Network | | |

NWA National Weather Association

NWP Numerical Weather Prediction

NWRAH NOAA Weather Radio All Hazards

NWS National Weather Service

OAR Office of Atmospheric Research

OB4 Operational Build 4

OB5 Operational Build 5

OCFM Office of the Federal Coordinator for Meteorology

OCWWS Office of Climate, Water, and Weather Services

ODAS Ocean Data Assimilation System

OFF Offshore Forecast

OMB Office of Management and Budget

OPAG Open Programme Area Group

OPC Ocean Prediction Center

ORD Operational Readiness Demonstration

OT&E Operational Test and Evaluation

POD Probability of Detection

POES Polar Operational Environmental Satellite

PORTS Physical Oceanographic Real Time System

PPW Partnership for Public Warning

QPF Quantitative Precipitation Forecast

RAWS Remote Automatic Weather Station

RCC Regional Climate Center

RCDAS Regional Climate Data Assimilation System

RFC River Forecast Center

RH Relative Humidity

RTNDA Radio and Television News Directors Association

RTVS Real Time Verification System

SAFESEAS System on AWIPS for Forecasting and Evaluation of Seas and Lakes

SAMA Small Aircraft Manufacturers Association

SAME Specific Area Message Encoding

SCAHS Small Craft Advisories for Hazardous Seas

SCLD Super Cooled Large Droplet

SEC Space Environment Center

SEM Space Environment Monitor

SHHH Self Help for Hard of Hearing People

SPC Storm Prediction Center

SREF Short Range Ensemble Forecast

SRF Surf Zone Forecast

SSM/I Special Sensor Microwave/Imager

STIP Science and Technology Infusion Plan

TAF Terminal Aerodrome Forecast

TAFB Tropical Analysis and Forecast Branch

TCV Tropical Cyclone VTEC

TDA Tactical Decision Aid

TEC Total Electron Count

TECO Technical Conference on Meteorological and Environmental Instruments and Methods of Observation

TOC Telecommunications Operations Center

TPC Tropical Prediction Center

UGC Universal Geographic Code

USCG United States Coast Guard

USWRP U.S. Weather Research Program

UV Ultra-Violet

VAAC Volcanic Ash Advisory Center

VACT Volcanic Ash Coordination Tool

VTEC Valid Time Event Code

WFO Weather Forecast Office

WMO World Meteorological Organization

WRF Weather Research and Forecast

WSO Weather Service Office

XML eXtensible Markup Language



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA's National Weather Service